# PROCEEDINGS

OF THE

# AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA

FOR

# PROMOTING USEFUL KNOWLEDGE

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Vol. IX

JANUARY 1862 TO DECEMBER 1864

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# PROCEEDINGS

OF THE

# AMERICAN PHILOSOPHICAL SOCIETY.

VOL. IX. JANUARY, 1862. No. 67.

*Stated Meeting, January* 3, 1862.

Present, eleven members.

Dr. FRANKLIN BACHE, in the Chair.

The judges and clerks of the annual election, held this day, reported the appointment of the following officers:

*President.*

George B. Wood, M.D.

*Vice-Presidents.*

John C. Cresson,
Isaac Lea,
George Sharswood.

*Secretaries.*

Charles B. Trego,
E. Otis Kendall,
John L. Le Conte, M.D.,
J. Peter Lesley.

*Counsellors for Three Years.*

Isaac Hays,
Robert E. Rogers, M.D.,
Henry C. Carey,
Robert Bridges.

*Curators.*

Franklin Peale,
Elias Durand,
Joseph Carson, M.D.

*Treasurer.*

Charles B. Trego.

Letters acknowledging the receipt of publications, were received from the R. Saxon Society, dated Leipsig, August 1, the Royal Society, dated London, July 1, and the London Linnean Society, dated July 14th, 1861.

Letters announcing donations to the Society were read from the Imperial Society of Naturalists, dated Moscow, June 1–13, the Imperial Academy at Vienna, dated June 25, the R. Saxon Society at Leipsig, dated July 9, and 30, the Society at Görlitz, dated July 30, the Society at Göttingen, dated July 19, and the Society at Marburg, dated August 14, 1861, desiring an exchange of publications. The Marburg Society was ordered to be placed on the list of correspondents, to receive the Proceedings.

A letter was read from the Directors of the U. S. Naval Observatory at Washington, which Institution was ordered to be placed on the list of correspondents, to receive as full a series of the Transactions as can be made up.

Donations for the Library were received from the Academies and Societies at St. Petersburg, Moscow, Vienna, Leipsig, Görlitz, Marburg, Göttingen, Haarlem, and Dijon; the School of Mines at Paris; the Royal and Linnean Societies of London; Prof. Secchi, of Rome; the Director of the U. S. Observatory at Washington; the Director of the U. S. Mint at Philadelphia; C. M. Wheatley, of Phœnixville; Charles Ellet, Jr., and Joseph Lesley, of Philadelphia.

Mr. Peale called the attention of the Society to the resumé of recent Antiquarian Science of Prof. Morlot, of Geneva, published by the Smithsonian Institution; and exhibited a specimen, from his own cabinet, of a saw-like stone, resem-

bling the implements with crenulated edges described as saws by Prof. Morlot.

Prof. Lesley presented three short original Vocabularies of African Dialects, obtained by Rev. Alexander Crummell, from among four hundred recaptured slaves, landed from a United States war vessel at Sino, in Liberia.

The following words were obtained by the Rev. Mr. Crummell, from a crowd of recaptured Africans, landed at Sino, in Liberia, about two hundred miles west of Cape Palmas. The slaves were about four hundred in number, and apparently of four or five distinct nationalities, each group conversing and keeping apart. Mr. Crummell had the aid of several intelligent interpreters whom he found among them, and took great pains to secure both the true words and the correct pronunciation. As the English language is gradually supplanting the native African dialects along that coast, every authentic addition to our collections becomes valuable. In re-writing these words I have employed the continental vowels. The v is a pure English v, and the consonants are written double only when clearly pronounced double. The most striking feature of these little vocabularies, is the application of almost the same dental dissyllable to a number of very dissimilar objects. I refer to the words Ade (1), Ato (3), Ane (4), Ede (6), Añe (8), Ionu (woman), Addo (stomach), Adu (teeth), Ade (tongue), Edda (hair), Etta (head), Etto (ear), Ido (eye). I suspected that some error had been occasioned by the use of pantomimic references to the members of the head, and that thereby the word for *head* was offered, when words for eye, ear, hair, tongue, teeth, &c., were required. But Mr. Crummell assured me that this source of error was carefully guarded against. We find the analogues of this dental dissyllable in the list of words meaning *head*, published in Vol. VII, page 151 of the Proceedings of this Society, among the Indian languages of America, in e. x. the Naguiler *Φie*, the Chippewayan *edΦie;* among the European languages, in the French *tête*, the Wallzau *totao*, the Caucasian *dudi* and *adada*, the Siberian *ty*, Chinese *teu*, and Manchu *udzu*. We find the same form meaning *hair* in the Vogul and Samoied words *otta*, *yta*, *yt*, *at*, *aeti*, and *tue*. It is remarkable how rarely this simple dental form occurs in that list; and that the confounding of *head* and *hair* under this form occurs in the same region.

| | Popo and Jelakufi People. | Awūsa People. | Dahomi. |
|---|---|---|---|
| 1. | Uli, | Ade, | Dok-po. |
| 2. | Biu, | Erver, | O$^{c}$-we. |
| 3. | Oku, | Urtong, | A-to. |
| 4. | Hodu, | Ane, | E$^{c}$ne. |
| 5. | Biat, | Etong, | A-tong. |
| 6. | Sid-da, | Ede, | Ai-ise. |
| 7. | Bok-koi, | De-din-ne, | Teg-we. |
| 8. | Tok-quos, | Añe, | Ta$^{c}$-to. |
| 9. | Tera, | 'Shaki, | Te$^{c}$-ne. |
| 10. | Go-mer,* | Eŏ, | O$^{c}$-o. |
| Sun. | Allar, | Don-kus-so, / Er-we, | We$^{c}$-di-ve. |
| Moon. | Wa-ta, | U-la-ti, | O$^{c}$-su. |
| Man. | Bar-bar, | Er-wu-su, | Su-nu. |
| Woman. | Mut-chi, | En-nun-nu, | Io-nu. |
| Hand. | Han-nu, | Al-lo, | Al-lo-pa. |
| Foot. | Koppa, | Af-fo, | Af-fo. |
| Face. | Fis-ca, | E$^{c}$-u-ma, | An-nu-ku-mi. |
| Stomach. | Chik-i, | Ad-do, | Ad-do-go. |
| Arm. | Dŭm-si, | Ab-lo, | A$^{c}$-wa$^{c}$. |
| Teeth. | Hai-ko-li, | Ad-u, | Ad-u. |
| Tongue. | Hal-lis-si, | Ad-e, | Ad-e. |
| Hair. | Gai-si, | Ed-da, | U-da. |
| Head. | Kai-si, | Et-ta, | U-ta. |
| Nose. | Han-si, | Em-mo-ti, | A$^{c}$-wo-ti. |
| Ear. | Quin-ni, | Et-to, | Et-to. |
| Eye. | Id-o, | En-ku-ve, | Un-de. |

Prof. Haldeman described certain peculiar words and sounds of the Basque language, obtained from natives, on his late visit to Europe.

The attention of the members present was invited to a set of lithographs of fossil sauroid bones, discovered by Mr. C. M. Wheatley, in the Phœnixville Tunnel, on the Schuylkill River, about thirty miles above Philadelphia, in rocks of the New Red Sandstone Formation. The originals form part of

* Basque, 'amar.

Mr. Wheatley's extensive cabinet of undescribed Mesozoic plants, shells and bones.

On motion of Mr. Fraley, Mr. Lesley was nominated Librarian for the ensuing year.

Pending nominations Nos. 425 to 445, and new nomination No. 446, were read.

And the Society was adjourned.

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*Stated Meeting, January* 17, 1862.

Present, twelve members.

Dr. FRANKLIN BACHE, in the Chair.

The Verein für Naturkunde im Herzogthum Nassau, was ordered to be placed upon the list of corresponding societies.

Donations for the Library were received from the Academy at Boston; the Massachusetts Board of Agriculture; the Medical Journal and Franklin Institute; B. V. Marsh, and Sherman & Son, of Philadelphia.

Dr. Bache announced the death of Sir John Forbes, a member of this Society, November 13, 1861, aged 74.

Prof. Lesley, read extracts from letters from Prof. James Hall, of Albany, relative to the Taconic System of Dr. Emmons.

The discussion of this system has lately been revived by Mr. Marcou, supported by the distinguished Bohemian palæontologist M. Barrande. Mr. Hall in these letters claims that the original error was made by the geologists of the New York Survey, who had charge of the eastern divisions of the State, in identifying the two slate formations on the two opposite sides of the Hudson River. Sir William Logan, chief of the Canada Survey, describes a similar error made in the great plain of the Richelieu River, before the existence of the great fault in Canada was known. Mr. Hall, accepting the identification in the Hudson region, proved long ago that the Hudson River slates were the same as the Taconic slates of Emmons. It now appears, that the Hudson River slates, east of the Hudson, are not the No. 3 (the upper part of the Lower Silurian) slates of New Jersey and Pennsylvania, west of the Hudson; and that that name must be dropped; or applied only to the slates of the Hudson River

Valley proper, at the base of the Lower Silurian Formation. In like manner, the Canadian geologists, having traced the great fault from Cape Gaspé, for seven hundred miles, along the south shore of the Lower St. Lawrence, past Quebec, across the plain of the Richelieu, and along the east shore of Lake Champlain, to meet the Hudson River Valley fault, which seems to terminate north of the Highlands, it is now certain that the Quebec Group, the Georgia rocks of Vermont, and the whole Taconic System of Dr. Emmons, belong to the Lower Silurian System near its base, and are a thickening eastward of the calciferous sand-rock over the Potsdam Sandstone which lies at its base. As soon as fossils were discovered in the slates on the east side of the great fault, those slates had to be referred to the base, instead of to the top of the Lower Silurian. But no further change was needful. Everything else remained the same. The structure of the Taconic range, and of the Canadian plain, remained the same. Dr. Emmons's Taconic System *beneath the Potsdam sandstone* has no existence now, any more than it had before the discovery of the fossils, and their recognition by Barrande. Professor Hunt, of Montreal, has shown how both M. Marcou and M. Barrande have mistaken Dr. Emmons's language, where he speaks of an "inversion" of the series in the Taconic Mountains, east of the Hudson. Dr. Emmons supposed the existence of not one great fault, but numerous parallel faults, bringing up lower and lower sandstones, slates and marbles, as one crosses them going east. His interpreters ignorantly suppose a fan-shaped structure in the Green and Berkshire Mountains, *overturning* the dips in the ranges to the west of them. Dr. Emmons taught an *apparent* inversion produced by the parallel upthrows. His interpreters teach an *actual* inversion by overthrow. The succession of the strata, however, is equally falsified by the view of Dr. Emmons and by that taken by his interpreters. Dr. Emmons, however, argued correctly from his premises. Did the parallel and increasing upthrows exist, then the Taconic System would be as he says it is, beneath the base of the Lower Silurian System. M. Marcou, on the contrary, misconceives the whole structure, and his conclusion flows just contrariwise from his premises. The recent careful map survey of the minute anticlinal subfolds of the great fault along the east shore of the foot of Lake Champlain, by Sir William Logan, has resulted in establishing the old accepted order of the rocks, as both the apparent and the real order of the Taconic System; and the only resource we have is to accept his theory, of a great thickening of the calciferous sand-rock along a deep

sea-shore line, extending from the mouth of the Gulf of St. Lawrence to Alabama; and a subsequent disruption and up-shove against this steep shore, along perhaps its whole extent, certainly along an extent of seven hundred miles. Along this whole line the once so-called "Hudson River Slates" (the No. 3, of the Pennsylvania Survey) are over-ridden by and abut against the Hudson River Slates proper (Taconic Slates, or No. 1, of the Pennsylvania Survey). Whether the Philadelphia and Baltimore System will obtain hereby, at last, its explanation, we can only conjecture. But certainly its rocks and minerals resemble some of the members of this "Quebec Group" or Taconic System; and there are evidences along its northwest edge, from Trenton past Philadelphia, of a great fault, in the place where we should be inclined to look for one.

Mr. Powel exhibited the stalk of an *Asclepias* from his garden, to show the strength of its fibre. Prof. Haldeman, mentioned an instance of thread spun from the nettle fibre.

Prof. Lesley was chosen Librarian for the ensuing year.

Standing Committees for the year were chosen, as follows:

*On Finance.*—Mr. Fraley, Mr. J. F. James, Mr. Samuel Powell (in the place of Mr. Justice, declining re-election).

*On Publication.*—Dr. Bridges, Mr. T. P. James, Dr. Hartshorne, Prof. Coppée, Dr. Wister.

*On the Hall.*—Mr. Peale, Judge King, Prof. Coppée.

*On the Library.*—Dr. Bell, Dr. Stevens, Dr. Coates, Mr. Foulke, Mr. Barnes (in the place of Mr. Ord, declining re-election).

The list of surviving members was then read, as follows:

*Summary.*

| | | | |
|---|---|---|---|
| On the List, January 1, 1861, | | | 376 |
| Elected in 1861, | In the U. S. | 4 | 8 |
| | Foreign | 4 | 384 |
| Reported as deceased, | In the U. S. | 6 | 9 |
| | Foreign | 3 | 375 |
| Resigned, in the U. S. | | | 1 |
| Number of members January 1, 1862, | | | 374 |
| Of whom are resident in the U. S. | | | 267 |
| And in foreign countries | | | 107 |

Nominations Nos. 425 to 446, and new nomination No. 447, were read.

Nominations Nos. 425 to 445 were ballotted for.

The report of the Committee on the Library was presented, and its consideration postponed, owing to the lateness of the hour.

The ballot boxes being opened, the following persons were declared by the presiding officer duly elected members:

Mirza Alexander Kasem Beg, of St. Petersburg.
Professor Otto Böhtlingk, of St. Petersburg.
Professor G. Forchhammer, of Copenhagen.
Professor J. S. Steenstrup, of Copenhagen.
Professor C. J. Thomsen, Director of the Royal Museum at Copenhagen.
Professor Andrew C. Ramsay, of England.
Professor Edouard Desor, of Neuchâtel.
Professor L. G. De Koninck, of Liége.
Professor Joachim Barrande, of Prague.
Professor Robert W. Bunsen, of Heidelberg.
Professor William Hoffman, of London.
Doctor H. R. Göppert, of Breslau.
Professor Alexander Braun, of Leipsig.
Mr. William J. Hamilton, of London.
Sir William J. Hooker, of London.
Doctor J. J. Kaup, of Darmstadt.
Doctor J. Anthony Froude, of Oxford.
Doctor Hermann Lebert, of Breslau.
Doctor S. Weir Mitchell, of Philadelphia.

And the Society was adjourned.

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*Stated Meeting, February* 7, 1862.

Present, eleven members.

Vice-President, Judge Sharswood, in the Chair.

A letter, accepting membership, was received from Dr. S. W. Mitchell, dated 1226 Walnut Street, January 31, 1862.

Letters were read from Mr. B. Whiting, senior officer, and Mr. Hubbard, Librarian of the Washington Observatory, dated January 21, 1862, acknowledging the receipt of publications.

A letter was received from M. Paul Bossange, dated New York, January 30, 1862, respecting the Annales de Chimie et de Physique.

Donations for the Library were announced from the Library Company of Cape Town, South Africa; the Bureau of Engineers at Paris; the R. Astronomical Society, the American Academy, American Antiquarian Society, and Boston Society of Natural History; Prof. H. A. Newton, of Yale College; the Publishers of Silliman's Journal; M. Carey Lea, of Philadelphia, and the Academy of Natural Sciences; the Adjutant General of the United States, and Col. Long, of the Bureau of Topographical Engineers at Washington; and the American Colonization Society.

Pending nominations Nos. 446, 447 were read.

The Committee on the Library submitted the accompanying special report of the Librarian, and recommended its suggestions to the favorable consideration of the Society.

The Librarian reports: That there have been added to the Library by donation in the year 1861, 317 books and pamphlets, and Proceedings of Corresponding Societies. The London, Edinburgh and Dublin Philosophical Magazine, and the Astronomische Nachrichten have been regularly received on subscription.

A large number of pamphlets, periodicals, and publications of societies remain unbound upon the shelves; fifty volumes of pamphlets have been disposed ready for binding, and 150 more volumes will be so disposed during the printing of the Catalogue. . . . . The printing of the Catalogue has proceeded slowly, but steadily. . . . . Two bound copies of the part already printed, are herewith presented, comprising Classes I and II, to page 212; exhibiting the books and pamphlets of a general nature, such as Encyclopedias, Scientific Magazines, the Publications of Societies, and the Catalogues of Libraries; together with books and pamphlets on the Mathematical

Sciences and Physics, including Astronomy, Meteorology, Navigation, Geodosy, Civil Engineering, Geography, Maps and Charts, and Voyages and Travels. The III Class of books and pamphlets on Chemistry, Mineralogy, Mining, Metallurgy, Geology, and Palæontology, carrying the Catalogue folio up to page 250, is in press. These three, with the IV Class, of 130 pages, and the V Class, of 115 pages, would make a volume of about 500 pages, which might be issued as a first volume. Leaving Classes VI, VII, and VIII, to make a second volume of about 600 pages. . . . . The Catalogue has been increased in size to these unforeseen dimensions by the introduction of over ten thousand pamphlet titles, which are usually in themselves longer than book titles, and are still further lengthened by their references. . . . . When the Catalogue is published, an increased use of the Library will probably be a consequence, for which additional room will be needed.

On motion, it was resolved that Dr. Bridges, Dr. Coates, and Dr. Le Conte, be a special committee to obtain information respecting the completion of the Catalogue of the Library.

On motion of Mr. Fraley, an appropriation of $349 35 was made, to pay the bill presented for printing the Catalogue, accompanying the Committee's Report.

And the Society was adjourned.

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*Stated Meeting, February* 21, 1862.

Present, twenty members.

Judge SHARSWOOD, Vice-President, in the Chair.

Dr. S. Weir Mitchell, a newly elected member, was introduced.

Pending nominations Nos. 446 and 447, and new nominations Nos. 448 to 452 were read.

The special committee appointed at the last meeting reported; the report was accepted and the committee discharged. The subject of printing the Catalogue was then discussed,

and on motion of Judge King, was referred back to the committee, with instructions to report at a future meeting of the Society, whether any change can be made in the style of the work, which will diminish the cost of printing the remainder.

On motion of Judge King, the Secretary was directed to communicate with the gentlemen charged with preparing notices of late members, Dr. Robert Hare, Dr. Elisha K. Kane, and the Honorable John K. Kane, and to respectfully request them to complete the same at their earliest convenience.

And the Society was adjourned.

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*Stated Meeting, March* 7, 1862.

Present, fifteen members.

Judge SHARSWOOD, Vice-President, in the Chair.

A letter was read from Sir Roderick I. Murchison, dated London, February 18, 1862, accepting membership.

A letter was received from Samuel Hazard, Librarian of the Historical Society of Pennsylvania, dated Philadelphia, February 25, acknowledging the receipt of the Proceedings.

A letter was received from S. H. Long, Col. T. E., accompanying a donation for the Library.

Pending nominations Nos. 446 to 452 were read.

New nominations Nos. 453, 454, 455 were read.

Dr. Bache announced the death of F. Martinez de la Rosa, a member of this Society, aged 73, who died in 1862.

Dr. Coates asked to be excused from preparing an obituary notice of Major John Le Conte, which on motion was granted, and Dr. Torrey was appointed in his stead.

Mr. Durand asked and received permission to borrow the MS. Journal of M. André Michaux, for the purpose of making extracts therefrom.

Mr. Tilghman offered the following:

*Resolved*, That a committee be appointed to report to the Society the names of any of its members, who may have been

publicly and notoriously engaged in acts of treason against the United States, and to inquire into the expediency of striking their names from the list of its members; which after debate was postponed for the present.

And the Society was adjourned.

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*Stated Meeting, March* 21, 1862.

Present, twenty-seven members.

Judge SHARSWOOD, Vice-President, in the Chair.

Letters were read from the Central Physical Observatory, of Russia, acknowledging and transmitting publications, dated St. Petersburg, June and July, 1861; from the Royal Bavarian Academy, dated Munich, Dec. 2, 1861, accompanying a donation to the Library; and from Mr. J. D. Serjeant, Librarian of the Academy of Natural Sciences, Philadelphia, dated March 14, offering for sale certain copies of parts of the Transactions of this Society; which was referred to the Committee on the Library.

Donations to the Library were presented from the Central Observatory of Russia; the Academy at Munich; the Boston N. H. Society; the Franklin Institute; the Royal Astronomical Society, London; the Dublin University Association; the State Library at Harrisburg; the Philadelphia Gas Works; Silliman's Journal; G. P. Putnam, of New York; Charles Nagy, of Hungary; and J. S. Newberry, of Washington.

Dr. Coates made a verbal communication respecting the Catalogue raisonnée of the Medical Library of the Pennsylvania Hospital, at Philadelphia.

Pending nominations Nos. 446 to 455 were read.

Mr. Tilghman offered the following resolution, in lieu of the one offered by him at the last meeting: "Whereas, Matthew F. Maury and W. F. Lynch have committed public and notorious acts of treason against the United States, it is

hereby ordered that they be expelled from this Society,"—which, with Mr. Gerhard's amendment, "And whereas, they have withdrawn themselves from the service of notice upon them by this Society," was agreed to; the ayes and nays being called, there were 23 ayes, 3 nays, and one excused from voting.

And the Society was adjourned.

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*Stated Meeting, April* 4, 1862.

Present, nineteen members.

Judge SHARSWOOD, Vice-President, in the Chair.

A letter was read from the Royal Danish Society, dated Copenhagen, July 1, 1861, acknowledging the receipt of publications.

Letters, acccompanying donations, were received from the Royal Society of Upsala; the Royal Danish Society, dated Copenhagen, July 1; the Royal Prussian Academy, dated Berlin, August 31; the Prince Jablonow'ski Society, dated Leipsig, November 20; the I. Academy, dated Vienna, October 28; the Dublin University Assocation, dated November, 1861; and Dr. Dunglison, dated Philadelphia, February 19, 1862.

Judge King moved that the MSS. presented by Dr. Dunglison be referred to a special committee, consisting of Judge King, Judge Sharswood, and Mr. Price.

Donations to the Library were received from the Academies at St. Petersburg, Berlin, Munich, Vienna, Turin, and Paris; the Societies at Upsala, Copenhagen, Leipsig, Emden, and Liverpool; the Royal Astronomical Society at London, and the Geographical Society at Paris; the Horticultural Society at Berlin; the Observatory at Pulkova; the Institutes at Salem, Massachusetts, and Buffalo, New York; the Hospitals at Boston and Harrisburg; from Franz Odernheimer, of Wiesbaden; C. M. Wetherill, of Indianapolis; and Miss Garesché, of Philadelphia; and from B. L. Emerson, Francis

Leopoldt, John Penington, and Blanchard & Lea, booksellers.

Mr. Price offered for publication in the Proceedings, a copy of the Opinion of the Supreme Court in the suit for taxes against the Society, with a brief communication introductory, as follows:

To the American Philosophical Society:

I have the satisfaction to report to the Society, that the suit of the City of Philadelphia against this Corporation, claiming to tax the Hall, has been decided in favor of the Society, and against the power of the City to tax this property. The Argument of Counsel has been printed, and numerous copies of it are in possession of the Society. As the Opinion of Judge Read, which is that of all the Court, is of historical interest, as well as protective of the title and interests of the Society, I cannot but recommend that it be printed in the Society's Proceedings. For this purpose I herewith furnish a copy of that Opinion. I am, very respectfully, &c,

Eli K. Price.

SUPREME COURT. THE CITY OF PHILADELPHIA v. THE AMERICAN PHILOSOPHICAL SOCIETY.

The Hall of the American Philosophical Society is not liable to taxation.

Eastern District. Error to the District Court of Philadelphia. Opinion by

Read, J.—Independence Square was not one of the original squares left open for public use by William Penn in his platform of the City of Philadelphia, but consisted of various lots purchased at different times under the authority of the Legislature of the Province. The intention was to erect a State-house and other public buildings upon it, and that the residue of the square should be and remain a public green and walk forever. The old court house had been built in 1707, in Market Street above Second, and was used not only as a hall of justice, but also as a legislative hall, in which the Provincial Assemblies transacted their business, and the general elections were held there. By the direction of the Representatives of the Freemen of the Province, Andrew Hamilton and William Allen purchased certain lots on the south side of Chestnut Street, lying contiguous to each other, and bounded by Delaware Fifth and Sixth Streets, and erected thereon the present State-house, which was begun

in 1729 and finished in 1734. On the 20th February, 1735–6, the General Assembly passed an Act vesting the State-house and other public buildings, and the lots, in other trustees, to and for the use of the Representatives of the Freemen of the Province, and to and for such other uses as the said Representatives at any time or times thereafter in General Assembly met, should direct and appoint. "Provided *always*, and it is hereby declared to be the true intent and meaning of these presents, that no part of the said grounds lying to the southward of the said State-house, as it is now built, be converted into or made use of for erecting any sort of buildings thereon, but that the said ground shall be inclosed and remain a public open ground and walk forever." Another contiguous lot having been purchased by William Allen, and both he and Andrew Hamilton having died without executing the necessary assurances, the General Assembly, on the 17th January, 1762, passed an Act vesting the whole property in new trustees, for the same uses declared in the former Act, and under the same proviso, with an immaterial alteration in its phraseology, and on the 14th May in the same year, they passed another Act, authorizing the trustees to purchase the remaining lots between Chestnut and Walnut Streets, for the same uses, and appropriated five thousand pounds for that purpose. By the first of these Acts, two lots, one at the corner of Sixth, and the other at the corner of Fifth Street, were directed to be conveyed, upon the payment of fifty pounds for each, the first to trustees for the use of the County of Philadelphia, for erecting a public building for the holding of courts or common halls for the said county; and the second to the Mayor and Commonalty of the City of Philadelphia, for erecting a public building thereon for the holding of courts or common halls for the use of the said city.

On the 28th February, 1780, the General Assembly of the Commonwealth vested the State-house, and the whole lot between Walnut and Chestnut and Fifth and Sixth Streets, in the Commonwealth, to the uses and trusts theretofore appointed and limited. The legal title was therefore in the State of Pennsylvania. From a club called the Junto, originated in 1727, by Benjamin Franklin, sprung a proposition to form a society composed of *virtuosi* or ingenious men residing in the several colonies, to be called The American Philosophical Society, to be held at Philadelphia, being the city nearest to the centre of the continent colonies, communicating with all of them northward and southward by post, and with all the islands by sea, and having the advantage of a good growing library. It was made in the form

of a circular, signed by Franklin, which bore date the 14th of May, 1743, old style, corresponding in the new calendar to the 25th, which is considered as the birthday of the present institution. In 1744, the Society, so far as relates to Philadelphia, was actually formed, and had several meetings, to mutual satisfaction, of the nine original members of the Philosophical Society. Six, including the three officers, President Hopkinson, Treasurer Coleman, and Secretary Franklin, are known to have belonged to the Junto.

Out of another Junto, established in 1750, arose another body in 1756, called "The American Society for Promoting and Propagating Useful Knowledge," held at Philadelphia; and in November, 1768, the name being changed to The American Society held at Philadelphia for Promoting Useful Knowledge, Dr. Benjamin Franklin was elected its President. The first institution, The American Philosophical Society, was also revived about the same time, and on the 9th February, 1768, ex-Governor Hamilton was elected President of this body.

On the 2d January, 1769, these two institutions having merged themselves into one body, being the present "American Philosophical Society, held at Philadelphia, for Promoting Useful Knowledge," Dr. Benjamin Franklin was elected President, and Dr. Thomas Cadwalader, Dr. Thomas Bond, and Joseph Galloway, Esq., were elected Vice-Presidents. The Society, aided by the General Assembly of the Province, erected temporary observatories, one at Philadelphia, the other at the residence of Mr. Rittenhouse, in Newton township, Montgomery County, about twenty miles northwest of Philadelphia, for observing the expected transit of Venus, that was to occur on the 3d of June, 1769.

Measures were also taken for making observations at Cape Henlopen, on the Delaware Bay, where a building was found that could be used for the purpose. The observations at these different places were all successful, and the account of them, and of the results to which they led, is given in full detail in the first volume of their Transactions, published in 1771, from the press of William & Thomas Bradford, in this city.

Upon their application, the General Assembly, on the 15th March, 1780, passed an Act incorporating them, and one of its provisions, as indicative of the liberal policy, humane spirit, and wise forethought of our forefathers in the midst of a war for existence, is too remarkable to be omitted. That it shall be lawful for the "Society, by their proper officers, at all times, whether in peace or war, to

correspond with learned societies as well as individual learned men of any nation or country, upon matters merely belonging to the business of the Society, such as the mutual communication of their discoveries and proceedings in philosophy and science, the procuring books, apparatus, natural curiosities, and such other articles and intelligence as are usually exchanged between learned bodies for furthering their common pursuits." This learned Society has always preserved its high character both at home and abroad, and numbers among its members the most distinguished men of the day. Of the past it enumerates among its Presidents, Benjamin Franklin, Thomas Jefferson, Rittenhouse, Wistar, Patterson, Tilghman, Duponceau.

On the 15th April, 1782, the General Assembly transferred the property and moneys of the Silk Society to the Philosophical Society, who were to be accountable, and redeliver the same whenever a majority of the subscribers to the Silk Society shall request it, in order to revive their institution. The Philosophical Society having represented to the Legislature the necessity of their having a Public Hall, Library, and other accommodation, and prayed that they would grant to them a lot of ground suitable and convenient for erecting a hall and other buildings, an Act was passed on the 28th March, 1785, granting to them a lot on Fifth Street, being a part of the State-house square, for that purpose. The third section is in these words: "Provided always, and it is the intention and meaning of this Act, that the said lot of ground shall not *be sold, leased or transferred*, by the said Philosophical Society or their successors, to any other person or persons, or bodies corporate; nor shall the same be applied by the said Society to any other use or purpose but that of erecting buildings for the accommodation of the said Society, as hereinbefore specified." Upon a further representation from the Society, that the restriction in the preceding Act as to the letting parts of the building was disadvantageous and unreasonable, the House thought it was founded in reason, and on the 17th March, 1786, passed an Act authorizing the Society to let or lease such *vaults* or *cellars* as they may think proper to make under the building by them to be erected on the lot aforesaid, and to let any other parts of said building for such purposes as may have affinity with the design of their institution, and for no other; the issues and profits to be applied to the purposes for which the Society was originally instituted, and to no other.

By the Act of the 8th April, 1785, the Commissioners of the County of Philadelphia, and the Wardens of the City of Philadelphia, having respectively paid to the Treasurer of the State the sum of

fifty pounds each, the lots at the corners of Sixth and Fifth Streets were severally vested in the said parties respectively, agreeably to the Act of 1762. The Act also provided that the old gaol and workhouse should be sold, and three thousand pounds of the purchase-money be applied to the purpose of erecting the County Court-house on the northwest corner of the State-house lot; and the wardens were authorized to take out of the personal estate of the latter corporation, three thousand pounds for erecting a court-house on the northeastern corner of the said State-house lot, and if it fall short of completing the building, then such sums as shall be necessary shall be taken out of the common stock of the city in the hands of the Treasurer of the Wardens. These lots were extended in depth to 88 feet by the Act of 29th March, 1787; and by the Acts of 27th March and 29th September, 1789, a lottery was authorized to raise eight thousand dollars to defray the expenses of erecting a common hall in the city of Philadelphia. On the 11th March, 1789, the City of Philadelphia was incorporated by an Act of the General Assembly, by the name of "The Mayor, Aldermen, and Citizens of Philadelphia," its limits being the original city plot of William Penn, as delineated in Holmes's Portraiture of it: two miles in length, from river to river, and one mile in breadth, from Vine to South Street.

By an Act of the 30th September, 1791, the Governor was authorized to contract for paving the footway round the State-house square at such times as the City Commissioners shall be paving the cartways of the several streets which surround the State-house. The same Act, after reciting that it would contribute to the embellishment of the public walks in the State-house garden, and may conduce to the health of the citizens by admitting a free circulation of air, if the east and west walls of the said garden were lowered, and palisadoes placed thereon, authorized the city corporation, at their expense, to take down the wall on the east and west sides of the State-house yard, within three feet of the pavement, and to erect thereon good and substantial palisadoes of iron, fixed on a stone capping, to be placed on such wall so prepared.

The City Hall was occupied by the executive, legislative, and judicial authorities of the city; whilst the Congress of the United States, on their removal from New York to Philadelphia, in 1790, occupied the County Court-house, the use of which was offered to them by the Commissioners of the City and County of Philadelphia, for their accommodation during their residence in Philadelphia, until their final removal to Washington, in 1800. The State-house had

been used by the General Assembly of the Province and State for their place of meeting from 1735 until the removal of the seat of Government to Lancaster, in November, 1799. The Congress of the Confederation had also used it during the Revolutionary war, and continued its occupation until the 24th of December, 1784, when they adjourned to meet in the city of New York. The east room on the first floor of this building was the scene of the Declaration of Independence, on the 4th July, 1776.

By a resolution of the General Assembly of the 17th March, 1802, Charles Wilson Peale was allowed to remove his Museum into the east end of the State-house, and to use the lower story of the east end, except the room formerly occupied by the Legislature as a committee-room, and the whole of the upper story, as he might find most convenient for the arranging and displaying the said museum, during the pleasure of the Legislature; but it was provided that the citizens should hold their general elections at the State-house according to law, and he was to take charge of the State-house and State-house yard, to open the doors of the hall, and permit the citizens to walk in the yard for recreation, and pass and repass at reasonable hours. Under this *regime* I have often visited the museum, which was a favorite place of resort, and as a boy, played marbles and prison-base in the State-house yard, whilst it was still surrounded by the high brick wall. On the 8th August, 1811, an ordinance was passed to carry out the permission to take down the east and west walls of the State-house yard, and erect iron palisadoes in place thereof, granted by the Act of 1791; and on the 10th March, 1812, the Legislature passed another Act, empowering the Select and Common Councils to take down the south wall and make a similar improvement, and giving them the charge of the yard, and repealing so much of the resolution of 1802 as gave Mr. Peale the charge and care of it; and on the 23d April, in that same year (1812), an ordinance was passed to carry the Act into effect, and the City Commissioners were directed to take charge of the State-house yard, and keep it in proper order.

On the 24th March, 1812, the Legislature authorized the County Commissioners to occupy the east and west wings of the State-house for the accommodation of the public offices of the city and county, and to convert the same into fire-proof buildings, or, if found most convenient, to rebuild the same upon a more extended plan; which law was adopted; and a fire-proof, and one other suitable portion of said building was appropriated exclusively to the safe-keeping of the records of the office of the Prothonotary of this court, and for his

use; but it was provided that the title in fee simple to the lot on which said offices may stand, be reserved to the Commonwealth.

By an Act of 13th March, 1815, the Legislature authorized the County Commissioners to take charge of the State-house, and to let the rooms, giving a preference of the upper part to Mr. Peale, but no lease to exceed one year, and repealed so much of the resolution of 1802 as made it the duty of Mr. Peale to take charge of the State-house; and after the sale to the city on the 23d March, 1818, they directed the Commissioners to give up possession of the lower part to the city.

On the 11th March, 1816, the Legislature passed a very disgracious Act, providing for the sale of the State-house and State-house yard, by running a street or streets through it, laying it out in lots, and valuing them so as to produce $150,000, and ordering the removal of the clock to Harrisburg; giving, however, an option before a specified period, to the city corporation to purchase the whole for $70,000 (with certain exceptions), but expressly declaring that in such case "no part of the said ground lying to the southward of the State-house, within the wall as it is now built, be made use of for erecting any sort of buildings thereon, but the same shall be and remain a public green and walk forever."

The two lots reserved and excepted out of the State-house square, were the County Court-house lot, and the lot on the northeast corner, reserved for the use of the city, and the lot on the east side of the square, granted to the American Philosophical Society under the Act of the 28th March, 1785, "and the two public offices which, by the Act of March 24, 1812, were put into the possession of the Commissioners of Philadelphia County, which said offices are thereby released from the claim of the State, and given and granted in fee simple, in lieu of the expense laid out in repairs on the State-house yard; and the offices and ground on which they stand, or on which they are allowed by the said Act to stand, are thereby granted and confirmed to the said City and County of Philadelphia forever."

By the Consolidation Act, the whole of this entire square, with all the buildings on it, with the exception of the lot of the American Philosophical Society, is vested in the City of Philadelphia, subject, of course, to the public use re-declared by the Act of 1816, as to all the ground lying south of the State-house.

By an Act of 16th March, 1847, the County Commissioners and the Select and Common Councils,—whose powers are now all merged in the consolidated city,—were severally authorized to erect a new

court-house and a new city hall on parts of the State-house square; but the authority thus given has never been exercised, and the Act of the 2d April, 1860, was never carried into effect; a fortunate circumstance in the present state of our finances.

It will be perceived by this statement, and their present occupation, that all the buildings belonging to the city on the State-house square, are devoted entirely to public purposes—to the courts of justice—including the Supreme Court, who are expressly provided for in the Consolidation Act, and to all the public offices of the county, and of the city, into which they are practically merged, and by whose authority they are provided with a local habitation.

The State, bearing in mind the services rendered to science by this Society, and at the same time determined that this lot should never be held by private owners, nor devoted to any but public uses connected with the welfare of her commercial metropolis, on the 11th February, 1842, authorized the Society to sell or lease their lot, and to make legal conveyance of the same, so that the same shall be used for the accommodation of courts of justice, and offices connected therewith, or for the public use of the City or County of Philadelphia. Under this restriction it is clear there can be only two purchasers or lessees,—the United States and the City of Philadelphia; and it is equally certain that the latter should be its owner. The proceeds of sale can only be applied to the purchase of convenient ground and buildings for the accommodation of the Society, and the residue for the furtherance of the objects for which the Society was instituted. By the second section of the Act of 13th March, 1847, the Society were further authorized to lease such portions of their buildings as may not be required for their immediate use, for such rents and in such manner as they may deem expedient; such rents to be used by them solely for promoting the objects for which they were incorporated.

On the 25th April, 1857, the Legislature gave their consent to the United States purchasing the lot and buildings in pursuance of the Act of 1842: the United States to hold the same for the purposes and business of courts of justice, and the offices and officers connected therewith. The vaults and cellars were allowed to be rented like those under the City Hall, and under many of our churches, for the storage of goods and groceries; the rooms in the lower parts were often lawyers' offices. At one time, the Athenæum was located there; and now, we believe, they are occupied solely by the United States: the issues and profits have always been applied to the fur-

therance of the scientific objects of the Society. The number of scientific men is always small, in any community, their means are generally limited, and their pursuits are of a character not to enlist the sympathies or enthusiasm of the wealthier classes of society. It would seem impolitic and unwise, therefore, for the State that fostered it, or the city which should be proud of it, to cut off their limited resources by taxation, even if it be legal, which was never dreamed of by anybody until 1853.

The taxes claimed are for city and State from 1853 to 1858, both inclusive, amounting, without interest or costs, to $1203.

All taxes on real estate in the City and County of Philadelphia are declared to be a lien on said real estate; the nature of which real estate is to a certain extent defined by the priority given to them over any recognizance, mortgage, judgment, debt, obligation, or responsibility which such real estate may become charged with or liable to. Now the eventual legal title to the Society lot is in the Commonwealth, whilst the Society have the use of it for what may be called a public purpose, the erection of a hall, library, and other buildings, as may be necessary for their proper accommodation. This is accompanied by a provision which no private individual could impose upon a fee simple estate, to wit,—a perpetual prohibition against alienation. The Society were expressly told that it was the intention and meaning of the Act making the grant, that the said lot of ground shall not be *sold, leased*, or *transferred* by the said Society or their successors, to any other person or persons, or bodies corporate; nor shall the same be applied by the Society to any other use or purpose but that of erecting buildings for the accommodation of the Society, as thereinbefore specified. A more guarded method of preserving this property, the free gift of the State, from being appropriated by any act of the law or of the Society, to any other than its expressed public and patriotic purposes, could not well have been devised. This provision being found to be too severe on the Society, they were permitted by legislative action,—1. To let the vaults or cellars under the building to be erected, and to lease any other part of the building for such purposes as may have affinity with the design of their institution, and for no other; but the issues and profits arising therefrom could only be applied to the purposes for which the Society was originally instituted, *and to no other.* 2. To sell or lease the lot, and make legal conveyance thereof, so as that the same shall be used for the accommodation *of courts of justice and offices connected therewith, or for public uses* of the City or County of

Philadelphia: Provided, however, that the proceeds of any such sale shall be applied to the purchase of convenient ground and buildings for the accommodation of the Society, so far as may be necessary to the furtherance of the objects for which the Society was instituted. 3. They were permitted to lease or let such portions of their building as may not be required for their immediate use; such rents to be used by them *solely for promoting the objects for which the Society was incorporated.*

It is clear, then, that the Society could not charge this lot by any recognizance, mortgage, judgment, debt, obligation, or responsibility, nor could they create any lien upon it; because it could not be sold by any form of execution, and this being the case, no taxes could be a lien upon it, and no form of proceeding to recover the same could create a lien upon this lot, because it could not be sold under any such judgment. It seems stronger in the case of taxes levied under the authority of the very Government that has expressly prohibited any sale of it, except in the cases specially pointed out, and by the character of its public uses as expressly declared. The uses for which it was given are public, and can neither be affected nor destroyed by the adverse action and process of a court of law. The court below were therefore right, and their judgment must be affirmed.

This Society numbers amongst its members many distinguished foreigners of great scientific eminence, and it corresponds with public bodies and private individuals devoted to the pursuit of science in every country in Europe; one of its latest correspondents being a Hungarian Society, whose Transactions are published in their native language. It has a most valuable library of about 27,000 volumes, of which a complete catalogue is now preparing at a very heavy expense, including a great many manuscript letters and papers of a most valuable and rare character, relating to the early history of this province and country. A large number of the works in the library are of a scarce and rare kind, and are not to be found on this side of the Atlantic, including a complete set of the Transactions of the Royal Society of London, commencing two centuries ago. The first President of this Society was the originator of the first fire company, the first public library, the first hospital, and the first academy, now the University of Pennsylvania, a signer of the Declaration of Independence, minister to France, one of our ministers plenipotentiary who signed the provisional articles and the definitive treaty of peace

between the United States and Great Britain, and finally one of the framers of the Constitution of the United States.

This was Dr. Benjamin Franklin, the patriot and the philosopher; and I cannot but express a confident hope that the City and the State of which he was so distinguished an ornament, will never permit the hands of the tax-gatherer to diminish the fund devoted to the interests of science in every part of the world, both in peace and in war, and belonging to a Society of which he was the founder.

Judgment affirmed.

Pending nominations Nos. 446 to 455 were read.

The special committee on the Catalogue presented a report, which on motion of Dr. Bache was adopted and the committee discharged.

On motion of Judge King, it was *Resolved*, That the Society authorize and request its officers to execute a power of attorney, to M. A. Germain, of Pontoise, notary, charged with the execution of the Will of the late M. André Michaux, constituting him the attorney at law and in fact of this Society, to maintain its rights to the legacy bequeathed to it therein; which power of attorney is now present and read before the Society.

Mr. Foulke tendered his resignation from the Library Committee, which was accepted, and Mr. Price was appointed by the Vice-President to supply the vacancy.

And the Society was adjourned.

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*Stated Meeting, April* 18, 1862.

Present thirty-six members.

Dr. FRANKLIN BACHE, in the Chair.

Mr. Sidney George Fisher, a new member, was presented by Mr. Fraley.

Baron Ostensacken and Mr. Kimber, members of Corresponding Societies, were introduced by Dr. Le Conte and Professor Coppée.

Mirza Alexander Casem Beg, a new member, signified his

acceptance of membership by letter, dated St. Petersburg, March 3–15, 1862.

Letters acknowledging the receipt of publications, and requesting the completion of their sets, were received from the Essex Institute, dated Salem, Massachusetts, March 28; from Harvard College, April 7; from the New York State Library, April 5; from the Astor Library, April 5; from the New York Lyceum, April 14; and from the Chicago Historical Society, April 7, 1862.

A letter announcing a large donation for the Library, was received from the Royal Academy of History, dated Madrid, March 12, 1862.

A letter was read from Dr. Wood, the President of the Society, to the Secretary, dated Florence, March 17, 1862.

A letter from Wm. Jones, Librarian of the Buffalo Young Men's Association, was read and referred to the Library Committee with power to take action.

Donations for the Library were received from the Academies at Paris and Philadelphia; the Societies of Science at Emden and Hobarton; the Royal Astronomical Society, Geological Society, Society of Arts, and Board of Trade at London; the Institutes at Dresden, Utrecht, and Philadelphia; the University at Christiania, and of New York; the Museums at Nürnberg, and Peel Park; the Free Public Library at New Bedford; the booksellers Voight and Günther, of Weimar; Schmidt, Müldener, and Zuchold, of Göttingen; Norton, of New York; and Leypoldt, of Philadelphia.

Mr. Fraley announced the death of a member, Mr. George M. Justice, on the 14th inst., in the 70th year of his age. Mr. Letchworth was appointed to prepare an obituary notice of the deceased.

A letter was read from Dr. Tafel, of St. Louis, dated March, 1862, accompanying a manuscript history of the English Language, offered for publication by the Society, which, on motion, was referred to the same committee, consisting of Dr. Coates, Professor Alexander, and Professor Coppée, that had charge of the memoir of Dr. Tafel, lately published in the Proceedings.

Professor Coppée introduced the subject of Flax and the manufacture of Linen in the United States, the history of which was then given by Mr. Kimber, of Philadelphia, with the causes leading to its abandonment in 1857, and the difficulties, probability, and utility of its revival. Other members present then spoke of the substitution of Flax for Cotton, and of the growth of Cotton in the Northern States, in China, and elsewhere. Dr. Rogers hoped to see the fibre of the Flax become a substitute for Cotton, and based the hope upon their similarity under a microscope, and the fact that no perfect solvent for the cement between the fibres had been yet discovered. Dr. Coates referred to communications on the subject in the Proceedings of the Rhode Island Society, and to manuscripts in the possession of an absent member, Mr. Powel.

Mr. Peale submitted for inspection a large collection of the Stone implements of the Ancient Britons, which he had lately received from England; they were obtained from barrows in the North Riding of Yorkshire.

Mr. Dubois made the following communication respecting the average health of Philadelphia, in comparison with other cities.

The last edition of the Encyclopædia Britannica, in the article MORTALITY, contains a tabular statement, which, however accurate in other respects, is far from being correct in regard to Philadelphia. It professes to show (but without citing authorities), the ratio of deaths in every thousand of the population, per annum, in various cities of the world, arranging them in the order of healthfulness. Philadelphia stands pretty far down in the catalogue, and, as will surprise every one, quite below London and New York. Its annual mortality is stated to be 26.8 per thousand.

In point of fact, the mortality for the years 1859, 1860, and 1861, being averaged, shows an annual proportion of 21 to 1000, if the still-born are included; if not, about 20 to 1000. This result places Philadelphia near the top of the list, and agrees with the general impression on this side of the ocean. It may be remarked that the year just elapsed, although not visited by any great epidemics, was unusually fatal in Philadelphia.

It may be interesting to add, in this connection, that the *average*

*duration of life*, found by multiplying the various ages of the dying by their numbers respectively, and dividing the sum of the products by the whole population, is 23 years, in Philadelphia. Excluding those who die under one year, and who may be said not to have the stamina to begin the race of life, the average duration is 30¼ years. This small allotment, it is scarcely necessary to observe, arises from the large proportion of deaths under the age of five years; nearly one-half of the entire sum.

Pending nominations Nos. 446 to 455 and new nominations Nos. 456 and 457 were read.

Nominations Nos. 446 to 455 were ballotted for, and there being no other business before the Society, the ballot boxes were examined, and the following persons were declared by the presiding officer to have been duly elected members of the Society:

Professor F. L. Otto Rœhrig, of Philadelphia.

Lieutenant H. L. Abbot, Corps of Topographical Engineers, United States Army.

Professor Oswald Heer, of Zurich, Switzerland.

Professor John Lindley, of London, F.R.S.

Professor Johann Liebig, of Munich, Bavaria.

Professor Friedrich Wöhler, of Göttingen, Germany.

Professor J. W. Dawson, of Montreal, Canada.

Captain Samuel F. Dupont, of the United States Navy.

Dr. George Englemann, of St. Louis, Missouri.

William S. Sullivant, Esq., of Columbus, Ohio.

And the Society was adjourned.

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*Stated Meeting, May* 2, 1862.

Present, seventeen members.

Vice-President, Judge Sharswood, in the Chair.

Letters accepting membership, were received from Professor J. W. Dawson, of Montreal, dated April 23, 1862, and H. L. Abbot, Lieutenant United States Army, Topographical Engineers, dated Camp Winfield Scott, April 24, 1862.

Letters acknowledging publications sent were received from the Royal Academy and Royal Zoological Society at Amsterdam, dated February and October, 1860, and from the Leeds Philosophical and Literary Society, dated October 29, 1861.

Letters transmitting donations for the Library were received from the Royal Academy at Vienna, dated December 28, 1861; from the Royal Academy at Amsterdam, November 15, 1861; the Royal Zoological Society at Amsterdam, August, 1860; the Royal Society at Göttingen, February 12, 1862; Col. Bache, Washington, April 19; and James Lenox, of New York, April 25, 1862.

Donations for the Library were received from the Academies at Buda, Vienna, and Amsterdam; the Societies at St. Gall, Lausanne, Göttingen, Leeds, and Bath; the Royal Society, Royal Institution, Royal Astronomical and Asiatic Societies, and Society of Antiquarians, at London; the Geographical Societies of London and Vienna; the Geological Societies in Vienna, Leeds, and Dublin; the Zoological Society in Amsterdam; M. M. Troyon, of Lausanne; Pierragi, of Paris; James Lenox, of New York; Blanchard & Lea, of Philadelphia, and Col. Hartman Bache.

Dr. Goodwin made some remarks upon the Faculties of the Mind and Causation, which were followed by a general discussion of the subject.

And the Society was adjourned.

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*Stated Meeting, May* 16, 1862.

Present, nineteen members.

Judge SHARSWOOD, Vice-President, in the Chair.

Prof. Roehrig, a lately elected member, was introduced by Mr. Lesley.

A letter, accepting membership, was read from S. F. Dupont, dated Wabash, Port Royal, May 8, 1862.

Letters acknowledging the receipt of publications was received from the New Jersey Historical Society, dated April

28, 1862; the Royal Society of Edinburgh, dated December 21, 1861; the Batavian Society at Rotterdam, dated September 30, 1861; the Boston Library, dated April 15, 1862.

A letter accepting the appointment to prepare an obituary notice of Mr. Justice, was received from A. S. Letchworth, dated Philadelphia, May 12, 1862.

Two letters respecting a communication offered for publication in the Transactions, were received from Dr. F. V. Hayden, dated Washington, April 29, and May 1, 1862.

A letter respecting the Michaux legacy was read from Dr. Wood, dated Paris, April 15, 1862, addressed to Judge King, as chairman of the special committee on that subject.

A letter requesting the librarian to make up a deficiency in the third volume of the Transactions for the Imperial Academy at St. Petersburg, was read from Baron R. Ostensacken, dated Washington, April 30, 1862.

A letter requesting the completion of the set of the Transactions from Volume III onwards (inclusive) for the Royal Institution, and to be placed on the list for the Transactions, was received from the Assistant Secretary and Keeper of the library, Benjamin Vincent, dated Albemarle Street, London, September 12, 1861. The librarian was directed to furnish the Transactions.

Donations for the library were received from the Bureau of Civil Engineers at Paris, the Royal Academy of Edinburgh, the Massachusetts Historical Society, the Franklin Institute, the New Jersey Historical Society, the Managers and Superintendents of the House of Refuge, Deaf and Dumb Institute, State Lunatic Asylum, Pennsylvania School for Feeble-minded Children, James J. Barclay, Ed. C. Jones, C. Sherman, and Joseph Lesley, of Philadelphia, Col. Hartman Bache, and Charles Ellet, Jr., of Washington.

Judge Sharswood announced the death of a member, Mr. Charles J. Ingersoll, at Philadelphia, on the 14th inst., aged 79. Judge Sharswood was appointed to prepare an obituary notice of the deceased.

Dr. Bache announced the death of another member, Dr. George W. Bethune, at Florence, on the 28th of April, aged

57. Dr. Dunglison was appointed to prepare an obituary notice of the deceased.

Mr. Lesley announced the death of a member of the Society, Prof. K. C. Von Leonhard, at Heidelberg, on the 23d of January, 1862, in the 83d year of his age.

A memoir was presented for the Transactions by Dr. Hayden, and referred to a committee, consisting of Dr. Leidy, Prof. Lesley, and Dr. Roehrig.

Prof. Lesley exhibited a manuscript map of the Alleghany Mountains on a large scale, and described especially the coal formation of Southern Virginia. He remarked that:

The coal region of Montgomery, Pulaski, Wythe, Washington, and Smith counties in Southern Virginia, is interesting in an economical as well as a geological sense. It furnishes species of semi-anthracite and semi-bituminous coal, which come in competition with the Oolitic bituminous coal of the Richmond basin, over the principal internal railroad of the Southern Atlantic States. This railroad penetrates the great primary range of mountains, the Blue Ridge, at Lynchburg, and then follows the course of the Great Valley, southwestward, to Knoxville and Chattanooga, in Eastern Tennessee. This Great Valley, of Lower Silurian limestone, extends from Newburg on the Hudson to Montgomery in Alabama, everywhere separating the range of the Blue Ridge, South Mountain, Smoky Mountain, or Black Hills, from the true Alleghanies or Appalachians. The rocks of the Blue Ridge Range, on the eastern side of the Valley, are a prolongation of the Green Mountains of Vermont, and consist of the Quebec group or Taconic system, now understood by Logan to be a thickening of the lowest Silurians (Calciferous Sandrock and Potsdam Sandstone or Primal Slates).* The Appalachian Mountains on its western side are Middle and Upper Silurian and Devonian formations. West of these rises the long high escarpment of the Carboniferous formation, forming the mountain plateau of Western Pennsylvania, Western Virginia, Eastern Kentucky, Central Tennessee, and Northern Alabama. The escarpment of this vast plateau, facing the east, and overlooking the Appalachian ranges, with their narrow, parallel, interval valleys, is the so-called Backbone Alleghany

* It is but just to say that the Rogerses maintained substantially this view before 1840, considering, as they did, the Blue Ridge System an enlargement merely of Formation No. I.

Mountain, beginning at Catskill on the Hudson, and ending in Alabama. The northern portion of this plateau is drained eastward by the branches of the Susquehanna, and westward by the branches of the Alleghany and Monongahela Rivers. All the waters of Middle Pennsylvania, Maryland, and Northern and Middle Virginia flow from the foot of this escarpment towards the Atlantic, breaking successively through the parallel Appalachian ridges of the subcarboniferous formations. The waters of the Tennessee River head also at the eastern foot of this escarpment, and flow along at its base for several hundred miles southwestward, before they turn west at Chattanooga, and break through its southern extremity, to make their great circuit through Alabama, Western Tennessee, and Kentucky to the Ohio River near its mouth. But in the middle of the region, namely, in Southern Virginia, its normal drainage is reversed. The New River heads in the Blue Range, crosses the Great Valley westward, breaks *into* (not *out of*) the Appalachians, striking the escarpment in its face, and flowing directly through and across it (as the Great Kanawha) through Western Virginia into the Ohio.

The cause of this phenomenon is to be found in a change of structure at this line. Most of the valleys and mountains north of it as far as New Jersey are unbroken anticlinals and synclinals. Most of the valleys and mountains to the south of it, as far as Alabama, are monoclinals, bounded by immense faults or downthrows.

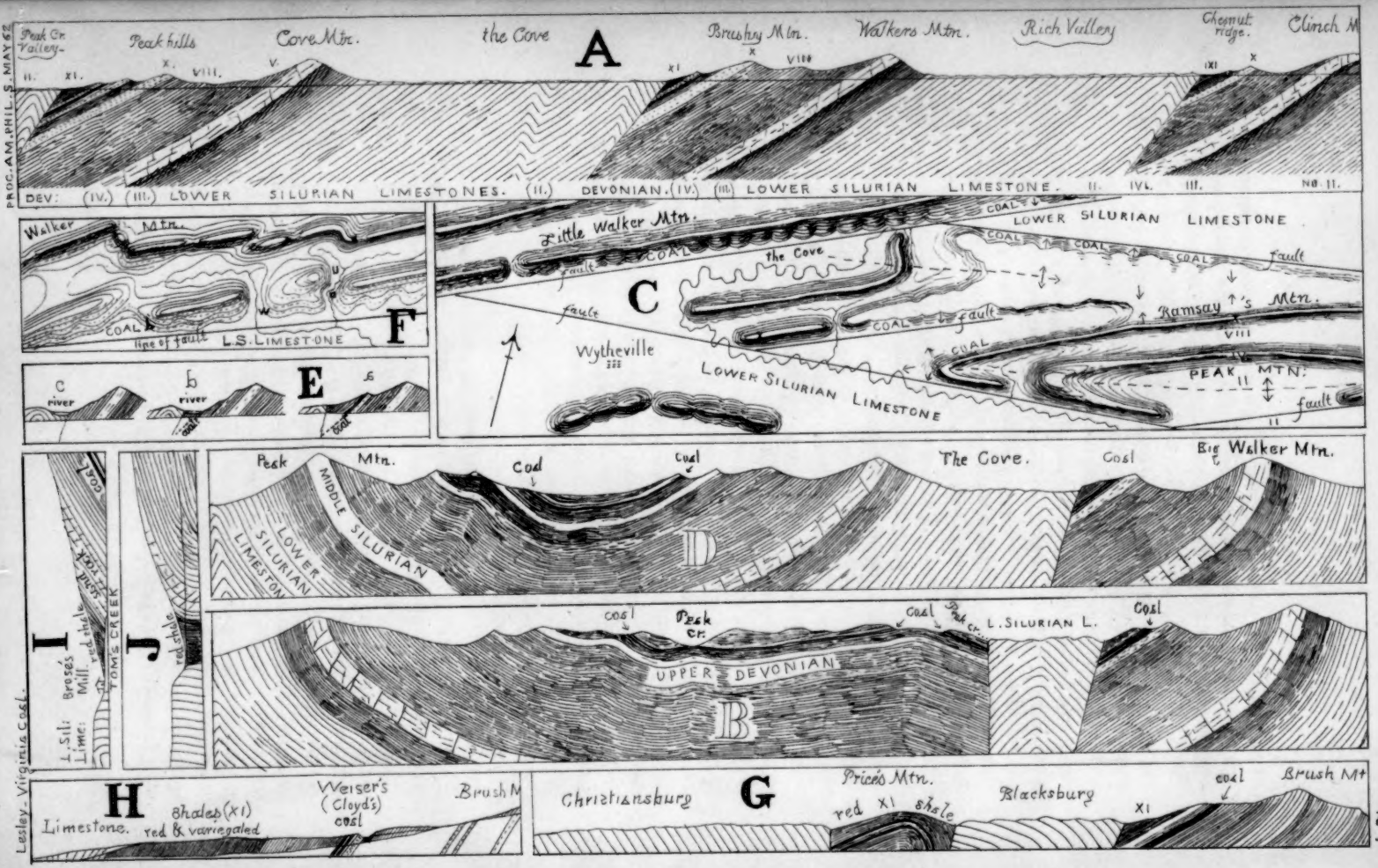
The Appalachian Mountains of Southern Virginia and Eastern Tennessee are grouped in pairs by these faults. The country for three or four hundred miles northeast and southwest, and from thirty to forty miles from southeast to northwest, is fractured in parallel strips from five to six miles wide. Each strip is tilted at such an angle (dipping southeast) that at each fault the upper edge of one strip (with its Carboniferous rocks) abuts against the bottom or Lower Silurian edge of the strip next to it. As the Palæozoic system, thus revealed (on edge) between any two of these faults, contains two massive sandrock formations, No. IV, Middle Silurian, and No. X, Upper Devonian, there occur necessarily between each pair of faults a pair of parallel mountains. The Palæozoic zone, therefore, included between the Great Valley and the Backbone escarpment, is occupied by as many pairs of parallel mountains as there are great parallel faults; and as these faults range in straight lines at nearly equal distances from each other, these mountains run with remarkable uniformity, side by side, for a hundred or two hundred miles, and are finally cut off, either by short cross faults, or by slight angular changes in the courses of the great faults. Thus we get an explanation of the

very unusual arrangement of the head waters of the Tennessee River, in long parallel branches, with few subordinate affluents, suddenly uniting through mountain gorges, or at the ends of long mountains.

In each pair of Palæozoic mountains the eastern one carries a coal area on its seaward flank; because, the last formation to dip against each fault is the Coal at the top of the series, abutting against the Lower Silurian of the limestone valley which always exists on the eastern side of the fault; as seen in the accompanying diagram, representing a section made across three pairs of mountains just north of Wythe. (See Fig. A.)

The coal here represented, however, is not the coal of the Carboniferous formation, commonly so called.

Underneath the true coal measures of Pennsylvania, Ohio, and Northwestern Virginia, and underneath the Millstone Grit Conglomerate (No. XII) at its base, and the Red Shale formation (No. XI), which underlies the last, there begins, even in Pennsylvania, to appear an older coal formation, connected with the uppermost Devonian, white, mountain Sandstone, No. X. It is seen in one or two beds two feet thick at the head waters of the Juniata. It is mined where the Monongahela waters cut through Chestnut Ridge from Virginia into Western Pennsylvania. It has been mined in the mountains on the Potomac *below* Cumberland. It appears occasionally in Northern Middle Virginia, on the western side of the Great Valley of Winchester. It increases in importance along the western outcrop of the great coal field through Eastern Kentucky, until it enters Tennessee. It seems, however, to attain its maximum development in Montgomery county, on the New River, in Southern Virginia, near the line of our section. Here it is seen to consist of two principal coal-beds and several minor seams. The lowest bed reaches the thickness of four feet, and the next one above it is in some places nine feet thick. In the Peak Hills, just east of Wythe, along the line of the railroad, numerous lenticular deposits of coal are seen, and thin distorted beds, the whole composing a formation several hundred feet thick. Near the New River, the two beds above-mentioned are seen to be covered by at least a thousand feet of Red shale; upon which rests a Subcarboniferous limestone; which abuts, at the fault, against other limestones belonging to the Lower Silurian age. Between Christiansburg and Blacktown, north of New River, a regular synclinal coal-basin has been preserved for a few miles upon the eastern side of the great fault, which crosses the river in front of the gap. In this coal-basin the two beds of coal are preserved, but in a crushed condition. To the southwest, two faults cut off a similar short basin from the regular


PROC. AM. PHIL. S. MAY 62
Peak Cr. Valley
Peak hills
Cove Mtn.
the Cove
Brushy Mtn.
Walkers Mtn.
Rich Valley
Chesnut ridge.
Clinch M
A
DEV: (IV.) (III.) LOWER SILURIAN LIMESTONES. (II.) DEVONIAN. (IV.) (III.) LOWER SILURIAN LIMESTONE.
Walker Mtn.
COAL
line of fault
L.S. LIMESTONE
F
Little Walker Mtn.
COAL
fault
the Cove
LOWER SILURIAN LIMESTONE
Ramsay 's Mtn.
Wytheville
PEAK MTN.
C
river
E
Peak Mtn.
Coal
MIDDLE SILURIAN
LOWER SILURIAN LIMESTONE
The Cove.
Big Walker Mtn.
D
UPPER DEVONIAN
Peak Cr.
L. SILURIAN L.
B
L. Sil: Lime:
Brosés Mill
red shale
TOMS CREEK
I
J
Lesley - Virginia Coal.
H
Limestone.
Shales (XI)
red & variegated
Weiser's (Cloyd's) coal
Brush M
Christiansburg
G
Price's Mtn.
red XI shale
Blacksburg
XI
coal
Brush Mt
L.P.L.

coal formation on the mountain, throwing up a wedge of Lower Silurian Limestone, as in the section, Fig. B.

It is here that the relationship of these great faults to the normal anticlinals and synclinals of the Appalachian region can be studied to great advantage; the presence of cross faults at high angles being exhibited by the sudden termination of the mountains, and by the tearing open, as it were, of one side of anticlinal coves. The sketch of the topography north of Wytheville, in Fig. C., will show how this has been effected, and render further description needless.

The straitness of the mountains is sometimes interfered with by small cross undulations or faults (it is not easy to determine which they are), producing offsets and minute coves, notches, and sometimes gaps, as seen in Fig. F, representing a portion of the first pair of mountains west of Wytheville.

The "plaster banks" of the Holston, are deposits of rock salt and gypsum and red marl, in excavations along faults, two of which are transverse, and one parallel to the main fault, at the foot of the Little Clinch Mountain. Over this main fault the river flows, probably burying the outcrop of the coal, although it is possible that the fault itself may here have cut out the coal, see Figs. E, *b* and *c*. Fig. E, *a*, represents the coal, and the fault further east.

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These gypsum deposits have no geological connection with the coal, however the analogy of the Michigan subcarboniferous gypsum and salt, and of the Nova Scotia gypsum deposits, might seem at first glance to suggest one. They are found along the valley for sixteen miles, but the principal deposit occupies the excavated axis of a broken anticlinal, in the lowest part of the Lower Silurian limestone. The plain of the Salt Works was once a triangular lake, scooped out of the soft, reddish sulphur-iron rocks of the base of the Palæozoic system, lifted to the surface by an anticlinal, terminated at its east or northeast end by a cross fracture, which lets the usual hard limestones of the valley settle down on the other side of it into their ordinary posture against the main fault. No plaster occurs above water-level. The Upper Banks occupy a cross fracture; and borings here, 500 feet deep, bring up salt water. At the Middle Banks, seven miles east of the Salt Works, the deposit seems to be on the line of the main fault. A mile from the Salt Works, it is dug on the small cross fault. At the Salt Works, the borings go down along the snap of the anticlinal, through 60 to 80 feet of plaster and red clay.

The decomposition of the sulphurets in these red rocks, have con-

verted the outcrop edges of the limestone, as well as the limestone clays and lime waters of the inflowings of the valley, into gypsum. There must have been standing pools along these excavated faults, or no deposits of solid gypsum and rock salt could have occurred. And the want of such, in other parts of this and the neighboring valleys has prevented similar deposits, especially in the great valley east of Wythe, where these lowest red rocks, with their sulphuret ores of iron and lead, appear at the surface in great force; and large quantities of these ores have been converted into peroxide of iron and carbonate of lead; no doubt by the loss of sulphuric acid, gone to produce gypsum, which has been carried off by the free drainage of the country. None of the main parallel faults of the back valleys, seem to bring these red rocks to the surface, except along the Holston; and even here, it required the crushing of the surface rocks along a supplementary anticlinal, to afford facilities, first for excavation, and then for decomposition.

It is possible, of course, that sulphur waters, issuing upwards along the line of the anticlinal and cross faults, may have assisted in the process; but there is no need to call in their assistance to explain the phenomenon, and such springs now are wanting elsewhere. On the other hand, masses of sulphuret of iron, inclosed in workable limonite ore, may be seen along the line, at Carleton Hill, twenty miles east of the Salt Works, and three miles east of large deposits of limonite ore of workable quality.

To account for the rock salt several hundred feet below the gypsum, seems more difficult. It lies in solid form, mixed and interstratified with compact red marl or clay, 200 feet below water-level; and the borings have gone down 176 feet further without reaching the bottom. Into this deep lake, the drainage of the Upper Devonian sandstones on one side of the fault, as well as of the Lower Silurian limestones on the other, must have always run and deposited their salt with mud and sand. But on top of the deposits of salt and mud was thrown down a stratum of blue slate more than a hundred feet thick; and over this again, the 60 to 80 feet of gypseous clays, until the lake was full. All this looks much more like a chemical than a mechanical precipitation.

The present connection of the mass of gypsum, mud, and salt with the Holston River, through underground crevices beneath the ridge of limestone which separates them, is apparent from the fact that water in all the wells not only always stands at the same level, but at the level of the river; nor does the heaviest pumping alter it.

The lower gypsum banks (Preston's) yielded in 1854, 2000 tons;

the cost at the mines being $3 per lump and $5 for ground plaster; eighty miles distant it has been sold for $20.

The yield in salt in 1853 was 300,000 bushels; 50 pounds to the bushel, and 6 bushels to the barrel, at 50 cents per bushel. Five furnaces were then running, and 24,000 gallons of brine pumped daily; 10,000 cords of wood supplied the fuel. Coal is now used, brought from the neighborhood of Wytheville by a branch railroad.

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Southwest of Wythe, the coal is traceable in all the little ravines and gaps of the first mountain west of the Great Valley; and in the third mountain west of it, far beyond the celebrated salt deposit of Smith county, and into Tennessee; but the single bed is thin and crushed, and the coal worthless. In the Peak Hills country, east of Wythe, the coal is almost an anthracite, and has been exposed to such movements that it rattles like sand out of the shovel, and cannot, therefore, go to market. Otherwise it is pure and good. This condition is apparently connected with the appearance of a massive sand-rock under it, which forms a terrace and range of small peaks along the side of the mountain. The coal bed itself is of large size, consisting of the following layers:

| | |
|---|---|
| Roof shale, sandy, several feet. | |
| Coal dirt and coal slate, . . . . . | 5 feet. |
| Yellow shale, two feet. | |
| Coal crushed to coarse dust, . . . . . | 2 feet. |
| Blue shale, &c., three feet. | |
| Coal crushed and coal slate, . . . . . | 2 feet. |
| Interval of twenty or thirty feet. | |
| Quarry rock. | |

On the south side of the New River the two coal beds are opened at Cloyd's. Here the summit and mid-rib of the Brushy Mountain is a pebbly conglomerate of great thickness, dipping 45° ⅃ south 34° east; over which, forming the southeastern slope of the mountain, are, first, yellowish flagstones; and then, soft clay slates; in all about 1200 feet thick, dipping the same way. Over these lies the "Quarry rock," a massive, gray, micaceous, quartzose sandstone, forming a line of little peaks. Ten feet above this is coal bed A, yielding about two feet of very bright pure semi-anthracite coal, much crushed and with the same dip. Thirty-five feet above A lies coal bed B, with its neat, undisturbed roof-rock of thin-bedded argillaceous sandstone, yielding about two and a half feet of good coal, out of the following section:

| | FEET. | INCHES. | |
|---|---|---|---|
| Coal, good, | | 10 | |
| —— slate, | 1 | 0 | |
| Coal, poor, | 1 | 2 | |
| Coal, crushed and slate, | | 6 | |
| Coal, poor, | | 6 | |
| Coal, crushed and slate, | 2 | 6 | |
| Coal, good, | 1 | 10 | |
| Coal, good, | | 9 | —in all 9.1. |

An outcrop of black slate seems to represent the place of a third bed of coal, about 50 feet above coal B. About 550 feet still higher, the red shales set in and continue for many hundred feet, all at the same dip of about 45°, with great regularity, until limestones appear just at the fault. This section is represented in Fig. H.

On the northeast side of New River, where it enters the gap, a minor fault, in the opposite direction, has downthrown the coal of the mountain, so as to cause the outcrop of coal A to disappear, with steep mountain dips. But coal B shows four feet of good solid coal, with five feet of slaty coal on top. (See Fig. D.)

At Poverty Gap, further east, both beds appear with a dip of about 17°⌟ south 13° east, 45 feet apart; A yielding 3 feet of excellent coal, and B eight feet thick, slaty and crushed on top, soft and sandy in the middle, and hard, fine, blacksmith coal 3 feet at the bottom. Cliffs of compact green sandstone, 40 feet high, tower over the gangway, and introduce (going east) a new feature in the vertical section. Here is observable the curious variety called "sand-coal;" rightly named, for it feels to the hand as if sanded over, but is apparently as pure and good as the rest.

At Brose's mill, still further east, the great fault can be distinctly seen, where the red shale over the cliff sandstone dips 30°⌟ southward, directly against the vertical Lower Silurian Limestone of the valley. At Knode's crossing, further east, the red shale side of the fault has been curved down so as to produce a plunge of red shale against the fault at an angle of 60°–70°. (See Figs. I. and J.)

At Millstone hollow (still going east), A yields 2.6 of good coal, and, 20 feet above it, B (under its cliffs) shows the following section:

| | FEET. | INCHES. |
|---|---|---|
| Soft coal, | | 8 |
| Slate and coal, | 4 | 0 |
| Soft coal, | | 10 |
| Slate, | 1 | 3 |
| Coal, | 3 | 0 |

In these and other mines on this side of the river, the variety of "sand-coal" always appears as a constant element in the section, but occupying sometimes the top and sometimes the middle or bottom of the bed. Everywhere, also, the coal of the small bed A (which has not this aspect) is recognized as the best. The lower part of B is the most reliable and productive. At the eastern end of the district, also the pebble-rock underneath A, is no longer recognizable, having slowly degenerated to a bed of clay slate or soft sandstone. But in its place, and at a much lower depth (about 200 feet) below A, appears a massive stratum of flinty gray sand-rock; from under which, at one place, painted water issues, and a coal seam is *reported*. This may correspond to a black slate stratum which is seen at one place (near Cloyd's) about 150 yards below coal A. Two beds at this horizon are also *reported* to exist at Shlusher's mines, in the little basin opposite Blacksburg.

In Price's Mountain, between Blacksburg and Christiansburg, the two coal beds with their slates, and the red shale formation above them, have been curiously let down, still in an anticlinal form, between two faults, so as to be inclosed between two valleys of Lower Silurian Limestone. (See Fig. G.)

These coal beds have been long known and dug at old openings long deserted and fallen in. Later gangways show the same coal as that in Brush Mountain, but more anthracitic, frangible, and crushed, dipping on the southern side of the anticlinal 25°⌟ south 10° east; and on the northern, 70°–80°⌟. Over Kyle's coal are thin, blue, shaly sand-rocks, full of fossil plants. Three or four separate beds appear to exist, but the dips vary somewhat. The area is small, and the coal of little or no value to a railroad trade.

The coal of Montgomery county, then, is a soft anthracite of a sandy grain, disposed to slaty structure, passing into a compact, smooth, conchoidal, quasicannel, but never, so far as I have seen, a true cannel coal. In one or two instances I noticed a prismatic structure, where the coal would be called and sold for semi-bituminous. In general it is a semi-anthracite, or a soft, flaming, white ash anthracite.

Portions of the beds exhibit numerous specks of sulphuret of iron, in flat discs, in the joints. No cubic crystals.

The chief use of the coal must be domestic, although its harder parts can compete in the Richmond market with Richmond coal, with blacksmiths and limeburners, and probably puddlers and furnace-keepers. But it will not be likely to go to sea, on account of its slack

waste and high per cent. of ash, and the competition of Pennsylvania portable anthracite.

The quantity available by gangways driven in from New River, Poverty Gap, and the other breaks in Brush Mountain, where the real supply is to be obtained for any future trade, is an important question, and the answer may be tabulated as follows:

A, being the amount above water-level of all gangways.
B, being the amount above water-level of Poverty Gap.
C, being the amount below water-level to the fault.

| | A. | B. | C. | TOTAL. |
|---|---|---|---|---|
| 1. Ten miles east of Poverty Gap, | 850,000 | 1,560,000 | 11,500,000 | 12,910,000 tons. |
| 2. Three to four miles west of Pov. Gap, | | 250,000 | 3,500,000 | 3,750,000 tons. |
| 3. Two miles next New River Gap, | Much less coal. | | 2,000,000 | 2,000,000 + tons. |
| 4. Five miles west of New River Gap, | | 750,000 + | | |

It is supposed that at 3 cents per ton per mile, a branch road exclusively for coal will pay 6 per cent on a capital, if its tonnage is at least double the number of dollars which the road has cost per mile. A road costing $15,000 should send over at least 30,000 tons per annum.

The data from which the above calculation is made, are as follows: The distance from Poverty Gap (the terminus of a branch road from Christiansburg) to Shlusher's, along the coal beds, is ten miles, 17,600 yards; the line of highest outcrops strait, the line of water-level gangway-mouths in the different ravines rises regularly eastward; the greatest breastings from the gangway, above water-level, at Poverty Gap, is 350 feet; the least breasting at Shlusher's is nothing; the height of Shlusher's coal crop above Poverty gangway, 250 feet; the loss by ravines at every half mile, say one-quarter; the average yield of B say 3 feet, of A 2 feet; loss in mining one-third.

Mr. Gerhard presented specimens of mammoth powder in use in Gunnery.

Pending nominations Nos. 456, 457, 458, and new nominations Nos. 459 to 465 were read.

The communication of Mr. Prettyman was referred to a committee consisting of Prof. John C. Cresson, Mr. Peale, and Mr. Baldwin.

And the Society was adjourned.

The following Chapter in Professor Tafel's communication, entitled "Investigations into the Laws of English Orthography and Pronunciation," was not received in time for publication in its proper place, following page 376 of Vol. VIII.

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## CHAPTER XIII.

### The Elementary Sounds of the English Language, represented in Writing.

§ 47. I have now examined the mode in which the elementary sounds of the English language are formed by the organs of speech. I have investigated the manner in which they combine with one another in the formation of syllables; and I have finally shown the process by which the syllables are connected so as to form words. The only subject that yet remains for discussion in connection with the physiological part of the English language is accent; for by accent the words are imbued, as it were, with living breath, or are individualized, and by it they are prepared for their work of expressing the human thought. English accent, however, is such an extensive subject that I reserve its discussion for a future part of my investigations. Meanwhile, I shall exhibit the various methods resorted to in the English language for the expression of the several elementary sounds of speech. In the preparation of this chapter I have been assisted very much by the works of the phoneticists, such as Ellis, Comstock, etc., who have taken particular pains in collecting all those instances, in which the English language, according to their ideas, has sinned against the rules of sound spelling.

The elementary vowel-sounds of the English language have been collected in § 6, in the following table:

| LONG. | SHORT. | LONG. | SHORT. |
|---|---|---|---|
| 1. *father*, . . | ———. . . | 8. *sheep*, . | 9. *ship*, |
| 2. *fast*, . . | 3. *fat*, . . . | 10. *pool, flute*, . | 11. *pull*, |
| 4. *age, bane*, . | 5. *end*, . . . | 12. *note*, . | ———. |
| 6. *fare*, . . | 7. *fell, let*, . | 13. *off, all*, . | 14. *not, what*. |

15. *her, bird*, either long or short.
16. *love, but*, always short.

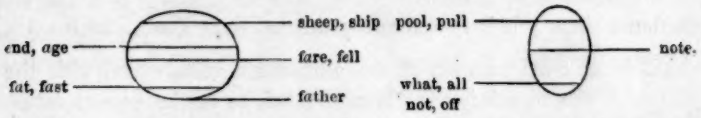
[Rem.—The only departure I allowed myself in the present table,

is that of regarding the vowels *e* in *end* and *fell* as two distinct sounds; the former as the corresponding short sound of *a* in *age*, and the latter of *a* in *fare*. In § 6, I was inclined to regard them as identical, or almost so, because in some individuals whose pronunciation I then studied, I could not detect any difference between them; they gave to both vowels a sort of middle sound between *a* in *age* and *fare*. Upon reconsidering this subject lately, and examining the pronunciation of other careful speakers of the English language, I came to the conclusion that there does exist a difference in the pronunciation of these two sounds in the English as well as in the German, French, and other languages. In order to prove that the same distinction of sound which exists between the long sounds of *a* in *fate* and *fare*, continues among the short sounds, compare the sounds of *e* in *end* and *let*, and this is best done by starting with the words *bane* and *late* (where the vowel *a* is pronounced alike), and winding up with the words *end* and *let*, thus *bā-ĕnd, lā-ĕt*. By doing so, it will be found that the sound of *e* in *end* is but a continuation of *a* in *bane*, while that of *e* in *let*, is broader than *a* in *late*.]

In the above table I have not endeavored to express the various vowel-sounds by peculiar signs, but I have limited myself to collecting such words in which these sounds are exhibited; but henceforth it will be necessary to represent these sounds abstractly from the words in which they occur, and for this purpose I propose the signs introduced in the next table.—These are not arbitrary signs, but each represents the shape of the mouth, and the position of the tongue in the pronunciation of the several vowel-sounds.

In taking an external view of the shape of the mouth in the pronunciation of the several vowel-sounds, we see that in the pronunciation of the vowels from 1 to 9, the mouth is extended, viz., , but in the pronunciation of the vowels from 10 to 14 it is contracted, viz., . Also, in the diagram of § 6, which delineates the position of the tongue in the pronunciation of each of these sounds, we see that in the pronunciation of *a* in *father*, the tongue lies flat in the mouth; therefore, the sign , in which the mark denotes the position of the tongue, will be used for the representation of this sound. In the pronunciation of *a* in *fast* the tongue is slightly raised; this sound, therefore, is represented by ; and so forth.

The following diagrams will furnish a key for these signs:




Of the two marks used in pointing out the position of the tongue, the one which is white, viz., (○), represents the long vowels, and the other which is black, viz., (●), the short: these marks are borrowed from musical notation.

As regards the names by which to call the signs, I propose to follow the same plan which is pursued in the alphabet. Thus *a* in *age* will be called long *ā*, and its corresponding short sound, viz., *e* in *end*, short *ă*; *o* in *note*, will be called long *o*; *a* in *father*, long *ah*; *a* in *fast* or *aft*, long *a*(*ft*); and *a* in *fat*, short *a*(*ft*)—the two consonants in brackets are not to be pronounced, but the vowel *a* is to receive that sound which it has in *aft*. *A* in *fare*, and *e* in *fell*, I call *ai* (*r*); *a* in *all* and *what*, or *o* in *off* and *not*, *au*, or *awe*, and *u* in *flute* and *pull*, *oo*.

The above table, containing the long and short vowels in use in the English language, may therefore be expressed with the following signs and names:

1. = long *ah*,
2. = long *a* (ft),
3. = short *a* (ft),
4. = long *ā* (ge),
5. = short *ā* (ge),
6. = long *ai* (r),
7. = short *ai* (r),
8. = long *ee*,
9. = short *ee*,
10. = long *oo*,
11. = short *oo*,
12. = long *o*,
13. = long *aw*,
14. = short *aw*,
15. = *ur* (*fur*),
16. = short *u* (p).

In the pronunciation of No. 16, which is the unmodified vowel-

sound, the tongue occupies no particular position, but the mouth has its round shape; it is therefore represented thus, . In No. 15, which is an amalgamation of the unmodified vowel-sound with the smooth *r*, the mouth is slightly contracted, as in the pronunciation of *bird;* it will, therefore be represented thus: , and as its sound may either be protracted or shortened *ad libitum*, without altering the word any, this quality will be expressed by a combination of the black with the white mark. In calling this sound by name, I propose to pronounce the vowel together with the following *r*, viz., *ur* in *fur*.

§ 48. I now proceed to give the English spelling of the several elementary sounds in use in the English language.

a. Vowels and Diphthongs.

1. = long *ah:*

By *a*, as in *arm, father,*
" *ah*, " *ah!*
" *e*, " *sergeant,*
" *ea*, " *heart,*
" *aa*, " *to baa,*
" *i*, " *reservoir.*

2. = long *a* (ft):

By *a*, as in *aft, grass, calf,*
" *au*, " *laugh.*

3. = short *a* (ft):

By *a*, as in *black, at,*
" *ai*, " *plaid.*

4. = *ā* (ge):

By *a*, as in *chaos, aye,*
" *aa*, " *haak, Aaron,*
" *ae*, " *Gaelic,*
" *ai*, " *aim, hail,*
" *ao*, " *gaol,*
" *ay*, " *day,*
By *ea*, as in *great,*
" *ei*, " *veil,*
" *ey*, " *they.*

5. = short *a* (ge):

By *e*, as in *end,*
" *ea*, " *cleanse,*
" *ey*, " *Reynolds,*
" *ie*, " *friend,*
" *a*, " *Thames.*

6. = long *ai* (r):

By *a*, as in *fare,*
" *ai*, " *fair,*
" *e*, " *there,*
" *ea*, " *bear.*

7. = short *ai* (r):

By *e*, as in *bell, let,*
" *ea*, " *health, head,*
" *ei*, " *heifer,*
" *eo*, " *leopard,*
" *a*, " *any,*
" *ae*, " *Pœstum,*

By *ai*, as in *said*,
" *ay*, " *says*,
" *oe*, " *fœtitude*.

8. = long *ee*:

By *e*, as in *eve, fever*,
" *ea*, " *pea, heap*,
" *ee*, " *glee, feed*,
" *ei*, " *seize, ceiling*,
" *eo*, " *people*,
" *ey*, " *key*,
" *ae*, " *paean*,
" *ay*, " *quay*,
" *i*, " *machine*,
" *ia*, " *caviar*,
" *ie*, " *field, pier*,
" *oe*, " *diarrhœa*.

9. = short *ee*:

By *i*, as in *is, big*,
" *y*, " *hymn*,
" *ee*, " *been*,
" *ei*, " *teint*,
" *o*, " *women*,
" *u*, " *busy*,
" *ui*, " *build*.

10. = long *oo*:

By *o*, as in *lose, prove*,
" *oe*, " *shoe*,
" *oo*, " *too, mood*,
" *ou*, " *wound, soup*,
" *u*, " *flute, rude*,
" *ue*, " *flue, rue*,
" *ui*, " *fruit*,
" *ew*, " *blew*,
" *oeu*, " *manœuvre*.

11. = short *oo*:

By *o*, as in *wolf*,
" *u*, " *put, full*,
" *oo*, " *wood, book*,
" *ou*, " *would*.

12. = long *ō*:

By *o*, as in *so, note, old*,
" *oa*, " *oar, goat*,
" *oe*, " *foe, toe*,
" *oo*, " *floor, door*,
" *ou*, " *four, mourn*,
" *ow*, " *flow, bowl*,
" *oh*, " *oh!*
" *eo*, " *yeomen*,
" *ew*, " *sew*,
" *eau*, " *beau*,
" *au*, " *hautboy*.

13. = long *au*:

By *a*, as in *all, talk*,
" *au*, " *laud*,
" *aw*, " *law*,
" *o*, " *off, loss*,
" *oa*, " *broad*,
" *ou*, " *ought*.

14. = short *au*:

By *o*, as in *lock*,
" *a*, " *what*,
" *ow*, " *knowledge*.

15. = *u* (p):

a. *In accented syllables.*

By *u*, as in *up, but*,

By *o*, as in *love, son,*
" *oe*, " *does,*
" *oo*, " *blood,*
" *ou*, " *tough,*

By *o*, as in *fel'o-ny, pur'pose,*
" *oi*, " *por'poise,*
" *ou*, " *fa'mous,*
" *u*, " *dep'u-ty, cen'sus.*

b. *In unaccented syllables.*

By *a*, as in *a-fresh', men'ace,*
" *ai*, " *cap'tain,*
" *e*, " *bul'le-tin, di'et,*
" *ei*, " *sur'feit,*
" *ey*, " *al'ley,*
" *i*, " *abil'i-ty, ru'in,*
" *y*, " *tru'ly,*

16. (o) = *ur* (fur).

By *er*, as in *her, herd,*
" *ir*, " *bird, fir,*
" *or*, " *word, worth,*
" *ur*, " *fur, burn,*
" *our*, " *journey.*

§ 49. The table of *diphthongs* is found in § 8.

1. æɛ, in *aisle*, etc.
2. ɔi, in *height*, etc.
3. ɑɔ, in *spouse, fowl*, etc.
4. ɔu, in *gout, stout,*
5. ɑ°ɛ, in *toil, boy,*
6. iu, in *cue, tube.*

(Concerning the characters used in describing the diphthongs, see § 8, in the beginning.)

These diphthongs are spelled in the English language in the following manner:

1. æɛ:
By *i*, as in *child, hide, sign, high,*
" *y*, " *by, rhyme,*
" *ie*, " *pie,*
" *ye*, " *rhye,*
" *ei*, " *eider,*
" *eye*, " *eye,*
" *ui*, " *guide,*
" *uy*, " *buy.*

2. ɔi:
By *i*, as in *sight, side, indict,*
" *y*, " *scythe,*
" *ei*, " *height.*

3. ɑɔ:
By *ou*, as in *our, mouse, bough,*
" *ow*, " *now, fowl.*

4. ɔu:
By *ou*, as in *gout, doubt,*
" *ow*, " *bower.*

5. ɑ°ɛ:
By *oi*, as in *toil,*
" *oy*, " *boy.*

6. iu:
By *u*, as in *tube, Hugh,*
" *ue*, " *due,*
" *ui*, " *juice,*
" *eu*, " *feud,*
" *ew*, " *few,*
" *eau*, " *beauty,*
" *ieu*, " *lieu,*
" *iew*, " *view,*
" *you*, " *you.*

## b. Consonants.

§ 50. The consonants of the English language, which have been described in Chapter V., are represented in writing in the following manner:

### Labials.

1. *The hard consonant:*

By *p*, as in *pit, hop,*
" *pp*, " *happy,*
" *gh*, " *hiccough,*
" *ph*, " *diphthong.*

2. *The soft consonant:*

By *b*, as in *bow, sob,*
" *bb*, " *ebb, robber.*

3. *The non-sonant fluid consonant:*

By *f*, as in *fame, safe,*
" *ff*, " *off, traffic,*
" *ph*, " *phial, graphic,*
" *pph*, " *Sappho,*
" *gh*, " *laugh.*

4. *The sonant fluid consonant:*

By *v*, as in *vie, have,*
" *f*, " *of,*
" *ph*, " *Stephen.*

### Dentals.

1. *The hard consonant:*

By *t*, as in *top, at,*
" *tt*, " *Pitt, butter,*
" *th*, " *thyme, phthisic,*
" *d*, " *stopped,*
" *pt*, " *ptisan,*
" *ct*, " *ctenoid.*

2. *The soft consonant:*

By *d*, as in *day, bad,*
" *dd*, " *add, bladder,*
" *bd*, " *bdellium.*

3. *Fluid consonants of the first series:*

a. *Non-sonant:*

By *th*, as in *thunder, wrath,*
" *phth*, " *apophthegm.*

b. *Sonant:*

By *th*, as in *then, leather.*

4. *Fluid consonants of the second series:*

a. *Non-sonant:*

By *s*, as in *sin, case,*
" *c*, " *cent, fence,*
" *ss*, " *hiss, passing,*
" *sc*, " *scene,*
" *sch*, " *schism,*
" *st*, " *glisten, thistle,*
" *ps*, " *psalm,*
" *x*, " *beaux.*

b. *Sonant:*

By *z*, as in *zeal, seize,*
" *s*, " *his, rose,*
" *c*, " *suffice,*
" *x*, " *xanthic,*
" *cz*, " *czar,*
" *sc*, " *discern,*
" *ss*, " *scissors,*
" *zz*, " *buzz.*

5. *Fluid consonants of the third series:*

a. *Non-sonant:*

By *sh*, as in *shade, fish,*
" *shi*, " *fashion,*
" *ch*, " *machine,*
" *c*, " *officiate,*
" *ci, ce*, " *social, ocean,*
" *s*, " *sure, nausea,*
" *si*, " *mersion,*
" *t*, " *satiate,*
" *ti*, " *nation,*
" *sc*, " *fascia,*
" *ss*, " *cassia,*
" *ssi*, " *accession.*

b. *Sonant:*

By *z*, as in *azure,*
" *s*, " *treasure,*
" *si*, " *fusion,*
" *ti*, " *transition.*
By *ssi*, as in *scission.*

GUTTURALS.

1. *Hard consonant:*

By *k*, as in *keep, freak,*
" *c*, " *cap, frolic,*
" *q*, " *queen,*
" *qu*, " *pique, liquor,*
" *cc*, " *hiccough,*
" *ck*, " *black, jacket,*
" *ch*, " *chord, ache,*
" *gh*, " *lough.*

2. *Soft consonant:*

By *g*, as in *go, log,*
" *gg*, " *fagged, laggard,*
" *gu*, " *vogue, guide,*
" *gh*, " *ghost,*
" *ck*, " *blackguard.*

c. SEMI-VOWELS AND VOWEL-CONSONANTS.

§ 51. 1. *R-sound.*

By *r*, as in *roll, pair,*
" *rr*, " *burr, marry,*
" *rrh*, " *myrrh,*
" *rt*, " *mortgage,*
" *wr*, " *write.*

2. *L-sound.*

By *l*, as in *light, file,*
" *ll*, " *ball, alley,*
" *ln*, " *kiln.*

3. *Labial Nasal:*

By *m*, as in *mind, flame,*
" *mm*, " *mammon,*
" *mn*, " *hymn,*
" *mb*, " *lamb, lambda,*
" *mp*, " *contempt,*
" *tm*, " *tmesis.*

4. *Dental Nasal:*

By *n*, as in *no, man,*
" *nn*, " *Ann, banner,*
" *mn*, " *mnemonics,*
" *pn*, " *pneumatics,*
" *kn*, " *know,*
" *cn*, " *Cneus,*
" *gn*, " *gnaw.*

5. *Guttural Nasal:*

By *n*, as in *thank,*
" *ng*, " *thing,*
" *ngue*, " *tongue.*

6. *Labial Vowel-consonant:*

By *w*, as in *wife, woo,*
" *u*, " *quill, suavity,*
" *o*, " *reservoir,*
" —, " *one.*

7. *Palatal Vowel-consonant:*

By *y*, as in *year, you,*
" *i*, " *million, onion,*
By *j*, as in *hallelujah,*
" *e*, " *ewe, hew,*
" —, " *use.*

d. Consonantal Diphthongs.

§ 52. With regard to the consonantal diphthongs, their spelling is found under the head of the single consonants of which they are composed, with the exception of the following combinations, where peculiar characters are used for their representation:

1. *tsh:*

By *ch*, as in *church,*
" *tch*, " *fetch,*
" *t*, " *nature,*
" *ti*, " *question.*

2. *dzh:*

By *g*, as in *gentle, Gipsy,*
" *ge, gi*, " *George, legion,*
" *dge*, " *bridge,*
" *dg*, " *judgment,*
" *j*, " *judge,*
" *di*, " *soldier,*
" *ch*, " *ostrich.*

3. *ks:*

By *ks*, as in *steaks,*
" *cks*, " *bricks,*
" *cs*, " *mimics,*
" *x*, " *exile,*
" *cc*, " *accent.*

4. *gz:*

By *x*, as in *example,*
" *gs*, " *figs,*
" *ggs*, " *eggs.*

5. *ts:*

By *ts*, as in *kits,*
" *z*, " *mezzotinto.*

§ 53. Thus far the characters have been exhibited by which the several elementary sounds of the English language are represented in writing; I now invert this exhibition, and intend to show the number of elementary sounds, expressed by the single and double characters of English orthography.

a. *Simple Vowel-signs.*

*A has* 10 *sounds:*

1. *a*, as in *all, stalk,*
2. *a*, " *what,*
3. *a*, " *arm,*
4. *a*, " *fast, sand,*
5. *a*, " *fat,*
6. *a*, " *flare,*
7. *a*, " *ale,*
8. *a*, " *any,*
9. *a*, " *Thames,*
10. *a*, " *a-fresh, men'ace.*

*E has* 6 *sounds:*

1. *e*, as in *there,*
2. *e*, " *bell,*
3. *e*, " *end,*
4. *e*, " *her,*
5. *e*, " *eve,*
6. *e*, " *bul'lE-tin, diEt.*

*I has* 6 *sounds:*

1. *i*, as in *caprice,*
2. *i*, " *is, big,*

3. *i*, as in *sir, bird,*
4. *i*, " *child, file,*
5. *i*, " *reservoir,*
6. *i*, " *ru'in.*

*U has* 8 *sounds:*

1. *u*, as in *flute,*
2. *u*, " *pull,*
3. *u*, " *but, up,*
4. *u*, " *hurry,*
5. *u*, " *busy,*
6. *u*, " *tube,*
7. *u*, " *suavity,*
8. *u*, " *cen'sus.*

*O has* 12 *sounds:*

1. *o*, as in *old,*
2. *o*, " *nor,* (?)
3. *o*, as in *off,*
4. *o*, " *lock,*
5. *o*, " *love,*
6. *o*, " *word,*
7. *o*, " *women,*
8. *o*, " *lose,*
9. *o*, " *wolf,*
10. *o*, " *one,*
11. *o*, " *reservoir,*
12. *o*, " *pur'pose.*

*Y has* 5 *sounds:*

1. *y*, as in *yoke,*
2. *y*, " *hymn,*
3. *y*, " *myrrh,*
4. *y*, " *by,*
5. *y*, " *envy.*

b. *Compound Vowel-signs, or Digraphs.*

*AA has* 2 *sounds:*

1. *aa*, as in *baa, Aar,*
2. *aa*, " *Aaron.*

*AE has* 4 *sounds:*

1. *ae*, as in *Gaelic, Maese,*
2. *ae*, " *Aetna,*
3. *ae*, " *Caesar,*
4. *ae*, " *aerial.*

*AI has* 6 *sounds:*

1. *ai*, as in *aim,*
2. *ai*, " *air,*
3. *ai*, " *said,*
4. *ai*, " *plaid,*
5. *ai*, " *aisle,*
6. *ai*, " *cap'tain.*

*AO has* 3 *sounds:*

1. *ao*, as in *gaol,*
2. *ao*, as in *extraordinary,*
3. *ao*, " *aorist.*

*AU has* 4 *sounds.*

1. *au*, as in *fault,*
2. *au*, " *aunt, laugh,*
3. *au*, " *gauge,*
4. *au*, " *hautboy.*

*AW has* 1 *sound:*

1. *aw*, as in *awl.*

*AY has* 4 *sounds:*

1. *ay*, as in *day,*
2. *ay*, " *says,*
3. *ay*, " *quay,*
4. *ay*, " *ay.*

*EA has* 8 *sounds:*

1. *ea*, as in *beast,*

2. *ea*, as in *great*,
3. *ea*, " *cleanse*,
4. *ea*, " *bear*,
5. *ea*, " *bread*,
6. *ea*, " *earth*,
7. *ea*, " *heart*,
8. *ea*, " *real*.

*EE has* 5 *sounds:*

1. *ee*, as in *free*,
2. *ee*, " *breeches*,
3. *ee*, " *ne'er*,
4. *ee*, " *Beelzebub*,
5. *ee*, " *seer*.

*EI has* 8 *sounds:*

1. *ei*, as in *deceive*,
2. *ei*, " *surfeit*,
3. *ei*, " *veil*,
4. *ei*, " *heir*,
5. *ei*, " *heifer*,
6. *ei*, " *cider*,
7. *ei*, " *height*,
8. *ei*, " *being*.

*EO has* 5 *sounds:*

1. *eo*, as in *people*,
2. *eo*, " *leopard*,
3. *eo*, " *George*,
4. *eo*, " *yeoman*,
5. *eo*, " *feod*.

*EU has* 2 *sounds:*

1. *eu*, as in *feud*,
2. *eu*, " *rheum*.

*EW has* 3 *sounds:*

1. *ew*, as in *pew*,
2. *ew*, " *drew*,
3. *ew*, " *sew*.

*EY has* 3 *sounds:*

1. *ey*, as in *key*,
2. *ey*, as in *they*,
3. *ey*, " *alley*.

*IA has* 1 *sound:*

1. *ia*, as in *caviar*, (*cavîr*).

*IE has* 4 *sounds:*

1. *ie*, as in *pie*,
2. *ie*, " *field*,
3. *ie*, " *sieve*,
4. *ie*, " *friend*.

*OA has* 4 *sounds:*

1. *oa*, as in *boat*,
2. *oa*, " *oatmeal*,
3. *oa*, " *cupboard*,
4. *oa*, " *broad*.

*OE has* 6 *sounds:*

1. *oe*, as in *shoe*,
2. *oe*, " *toe*,
3. *oe*, " *does*,
4. *oe*, " *foetus*,
5. *oe*, " *foetid*,
6. *oe*, " *doer*.

*OI has* 6 *sounds:*

1. *oi*, as in *boil*,
2. *oi*, " *turkois*,
3. *oi*, " *choir*,
4. *oi*, " *scrutoir*,
5. *oi*, " *reservoir*,
6. *oi*, " *porpoise*.

*OO has* 4 *sounds:*

1. *oo*, as in *cool*,
2. *oo*, " *book*,
3. *oo*, " *blood*,
4. *oo*, " *floor*.

*Ou* has 9 sounds:

1. *ou*, as in *arouse*,

2. *ou*, as in *gout*,
3. *ou*, " *ought*,
4. *ou*, " *course*,
5. *ou*, " *rough*,
6. *ou*, " *journey*,
7. *ou*, " *youth*,
8. *ou*, " *could*,
9. *ou*, " *famous*.

*OW* has 3 sounds:
1. *ow*, as in *now*,
2. *ow*, " *flow*,
3. *ow*, " *knowledge*.

*OY* has 1 sound, as in *boy*.

*UE* has 2 sounds:
1. *ue*, as in *due*,
2. *ue*, " *blue, rue*.

*UI* has 5 sounds:
1. *ui*, as in *juice*,
2. *ui*, " *fruit*,
3. *ui*, " *build*,
4. *ui*, " *guile*,
5. *ui*, " *ruin*.

*UY* has one sound, as in *buy*.

*YE* has one sound, as in *rye*.

c. *Triple Vowel-signs, or Trigraphs.*

*AYE* has one sound, as in *aye*.

*EAU* has 2 sounds:
1. *eau*, as in *beauty*,
2. *eau*, " *beau*.

*EYE* has one sound, as in *eye*.

*IEU* has 3 sounds:
1. *ieu*, as in *adieu*,
2. *ieu*, as in *Messieurs*,
3. *ieu*, " *lieutenant*.

*IEW* has one sound, as in *view*.

*OEU* has one sound, as in *manoeuvre*.

*UOY* has one sound, as in *buoy*.

d. *Simple Consonantal and Semi-vowel Signs.*

This table includes all simple signs of the English alphabet, with the exception of the vowel-signs.

*B* represents one sound, as in *boy, babe*.

It is mute:
In *bd*, as in *bdellium*,
" *bt*, " *doubt, subtle*,
" *mb*, " *dumb, climb*.

*C* represents 5 sounds:
1. *c*, as in *cap, arc*,
2. *c*, " *cent, cider*,
3. *c*, as in *suffice*,
4. *c*, " *ocean*,
5. *c*, " *cicerone*.

It is mute:
In *ct*, as in *victuals, indict*.

*D* represents 3 sounds:
1. *d*, as in *day, bad*,
2. *d*, " *hopped*,
3. *d*, " *soldier*.

It is mute in *handkerchief, Wednesday*, etc.

*F* represents 2 sounds:
1. *f*, as in *fame, life,*
2. *f*, " *of.*

It is mute in *halfpenny.*

*G* represents 5 sounds:
1. *g*, as in *go, log,*
2. *g*, " *gem, gill,*
3. *g*, " *rouge,*
4. *g*, " *poignant,*
5. *g*, " *long.*

It is mute:
In *gl*, as in *oglio,*
" *gm*, " *phlegm,*
" *gn*, " *gnarl, bagnio.*

*H* represents 1 sound, as in *hat, help.*
It is mute, as in *humble, heir.*

*J* represents 2 sounds:
1. *j*, as in *join,*
2. *j*, " *hallelujah.*

*K* represents 1 sound, as in *keep, break.*
It is mute, as in *know, knight.*

*L* represents 2 sounds:
1. *l*, as in *life, bold,*
2. *l* (*r*) as in *colonel.*

It is mute:
In *ld*, as in *could, chaldron,*
" *lf*, " *calf,*
" *lk*, " *talk,*
" *lm*, " *calm,*
" *ls*, " *halser.*

*M* represents 2 sounds:
1. *m*, as in *man, from,*
2. *m*, as in *comptroller.*

It is mute, as in *mnemonics.*

*N* represents 2 sounds:
1. *n*, as in *no, nun,*
2. *n*, " *ink.*

It is mute:
In *mn*, as in *hymn, limn,*
" *ln*, " *kiln.*

*P* represents 2 sounds:
1. *p*, as in *pit, top,*
2. *p*, " *cupboard.*

It is mute:
In *pn*, as in *pneumatic,*
" *pph*, " *sapphire,*
" *ps*, " *psalm,*
" *pt*, " *ptisan, receipt, attempt,*
" *rps*, " *corps.*

*Q* represents 1 sound, as in *quill.*

*R* represents 2 sounds:
1. *r*, as in *row,*
2. *r*, " *her.*

It is mute:
In *rl*, as in *Marlborough,*
" *rs*, " *worsted.*

*S* represents 4 sounds:
1. *s*, as in *sick,*
2. *s*, " *close,*
3. *s*, " *nausea,*
4. *s*, " *treasure.*

It is mute:
In *sl*, as in *aisle, isle,*
" *sn*, " *demesne,*
" *sc*, " *viscount;* at the end of words, as in *chamois, corps.*

*T* represents 3 sounds:
1. *t*, as in *tin, pit,*

2. *t*, as in *nation*,
3. *t*, " *feature*.

It is mute:

In *st*, as in *christen*, *chestnut*, *waistcoat*, *castle*.
" *rt*, as in *mortgage*; at the end of words, as in *ragout*, *depot*.

*V* represents 1 sound, as in *vile*, *love*.

*W* represents one sound, as in *wise*.

It is mute:

In *wr*, as in *write*,
" *sw*, " *sword*, *answer*,
" *tw*, " *two*.

*Y* (see among vowels.)

*Z* represents 3 sounds:

1. *z*, as in *zeal*, *freeze*,
2. *z*, " *azure*,
3. *z*, " *mezzotint*.

e. *Compound Consonant-signs.*

*Ch* has 4 sounds:

1. *ch*, as in *church*,
2. *ch*, " *ostrich*,
3. *ch*, " *champaign*,
4. *ch*, " *ache*, *Christ*.

It is mute, as in *drachm*, *yacht*.

*Ck* has 2 sounds:

1. *ck*, as in *back*, *brick*,
2. *ck*, " *blackguard*.

*Gh* has 4 sounds:

1. *gh*, as in *ghost*,
2. *gh*, " *laugh*, *rough*,
3. *gh*, " *hough*, *lough*,
4. *gh*, " *hiccough*.

It is mute, as in *Armagh*, *usquebaugh*, *weigh*, *nigh*, *bough*, *though*, *through*, *Hugh*.

*Ng* has 2 sounds:

1. *ng*, as in *thing*,
2. *ng*, " *finger*.

*Ph* has 4 sounds:

1. *ph*, as in *phial*, *Joseph*,
2. *ph*, as in *Stephen* (v).
3. *ph*, " *aphelion* (f-h).
4. *ph*, " *diphthong* (p).

*Sc* has 4 sounds:

1. *sc*, as in *scour*, *sceptic*,
2. *sc*, " *scene*,
3. *sc*, " *conscience*,
4. *sc*, " *discern*.

*Sch* has 2 sounds:

1. *sch*, as in *school*,
2. *sch*, " *schism*,

*Sh* has one sound, as in *ship*, *fish*.

*Th* has 3 sounds:

1. *th*, as in *thank*, *bath*,
2. *th*, " *than*, *mother*,
3. *th*, " *thyme*, *isthmus*.

*X* has 4 sounds:

1. *x*, as in *expect*, *exile*,
2. *x*, " *example*,
3. *x*, " *beaux*,
4. *x*, " *xanthic*.

After thus showing the full extent of the field of my investigations, and after giving to the reader some idea of the work before me, I close this first part. In the next I shall commence the work of solving the problem of English pronunciation and orthography, beginning with a history of the formation of the English tongue.

# NOTE.

The Committee beg leave to append to the above the following note:

With regard to the character, so generally ascribed in Germany, of greater softness to the sounds of "d," "g," and "b," when respectively compared with those of "t," "k," and "p," it appears to the members of the committee that the production of the latter sounds is accompanied with less force of breath and of the muscular action of the tongue, and is accompanied with a larger volume of intonation than that of the former. It therefore seems to them that the character of greater hardness, rather than of softness, would be naturally attached to "d," "g," and "b." They would ask whether, instead of the more recent ascriptions of softness and hardness, and if we reject the scholastic distinctions of slender, middle, and rough, tenues, mediæ and aspiratæ, *ψιλά*, *μέσα*, and *δασέα*, a more correct idea would not be given by the use, in this case, of the words delicate or well-defined, as applies to "t," "k," and "p," and coarser, to "d," "g," and "b."

They observe in this, as in some other works of great learning and just reputation, from the German school, a prevailing or total omission of the theta and the aspirated delta, or Anglo-Saxon ð, as they occur in the English words "thick" and "this." The committee avoid the inquiry whether the pronunciation of the Latin contained these sounds, and of the authority, in this respect, of the Greek, kept up as a living language to our days; but certainly the theta and the aspirated delta cannot be rejected from the English. They do not appear to the committee as hissing sounds, but *sui generis*. They seem to be produced by protruding the tongue quite beyond the edge of the incisor teeth, and then emit-

ting a more delicate current of voice, prevented from forming the sound of "s" or "z" by the approach of the soft surface of the tongue so near as to render the sound quite smooth.

What are called the long English vowels, "a," "i," and "o," appear to the committee to be, in each instance, diphthongal; and they think that this will appear if these vowels are much prolonged in their pronunciation. Thus, if we express the force of "e" in the English word "there" by the character "ê," and the common sound of "e," as in "me," by the simple letter "e," long "a" will appear to be composed, consecutively, of "ê" and "e," which we may write ê-e, or if greatly prolonged, ê-ê-ê-ê-e-e.

"I" seems to be composed of "a" as in "ah," and in various French words; followed by "e," as when called long "e." Thus, if we express "a," as in "ah," by "$^{F}_{a}$," and use the common "e," we shall find "ī" to be "$^{F}_{a}$e," or, when prolonged, $^{F}_{a}$-$^{F}_{a}$-$^{F}_{a}$-$^{F}_{a}$-e-e.

"O" they would form by a sound not used in English in its simple form, that of "ô" in the French word "dôme;" (a sound which does not seem to them identical with English "u" in "cut;") and to this they would add the sound of "oo:" "ō" would then be "ô-oo," or, if prolonged, ô-ô-ô-ô-oo-oo. It is believed to be impossible to elongate "ā," "ī," or "ū," as can be done with every simple vowel, without dwelling on one or other of the above initial or concluding sounds.